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UNITED STATES NATIONAL MUSEUM

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## ADVERTISEMENT

The scientific publications of the National Museum include two series, known, respectively, as *Proceedings* and *Bulletin*.

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ALEXANDER WETMORE,

*Assistant Secretary, Smithsonian Institution.*

WASHINGTON, D. C., September 30, 1927.



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# AMERICAN WASPS OF THE GENUS *SCELIPHRON* KLUG

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## INTRODUCTION

The conspicuous black-and-yellow thread-waisted wasps of the genus *Sceliphron* are familiar to all who have taken the least notice of insect life. Equally familiar are the mud nests which these wasps construct on the timbers of buildings and elsewhere, inclosing within them spiders for the sustenance of their progeny.

The paper here presented, dealing with the genus *Sceliphron*, is a portion of a study made by the writer in 1916 while a graduate student at the Massachusetts Agricultural College, in partial fulfillment of thesis requirements for the degree of doctor of philosophy. Since entering the service of the Bureau of Entomology the writer has had opportunity to study all of the material of this genus in the collection of the United States National Museum, which has aided in clarifying certain points which were in doubt.

In 1918 Kohl<sup>1</sup> published a revision of the wasps of the subfamily Sceliphroninae of the world. In this paper all the species of the subfamily are placed in the genus *Sceliphron*. To this and certain other points of interpretation the writer can not agree; they will be discussed in detail below.

The present paper is in a sense supplementary to Dr. H. T. Fernald's studies of the Sphecinae and Chlorinae, other subfamilies in the family Sphecidae. Heartly thanks are hereby expressed to Doctor Fernald for the active interest which he has taken in this study and for assuming the responsibility for material loaned by a number of institutions and individuals. Thanks are also due to Guy C. Crampton for helpful suggestions regarding the anatomy of the group of insects under consideration, and to S. A. Rohwer for facilitating in every way possible the work of the writer at the National Museum.

<sup>1</sup> 1918, Kohl, Franz Friedrich. Die Hautflügler gruppe "Sphecinae," IV Teil, Die natürliche Gattung *Sceliphron* Klug (*Pelopolus*) Latrille. In der Annalen des Naturhistorischen Hofmuseums Wien, vol. 32.



## TERMINOLOGY

Except for the terms used in connection with the male genital structures, which have not been used by other authors very extensively in the interpretation of relationships in this group, the terminology employed does not depart from that in general use among the students of the aculeate Hymenoptera, and need not be defined in detail here. The explanation of the plates which accompany this paper will doubtless give sufficient information.

## MALE GENITALIA

The terminology used to designate the various genital structures seems to be in a state of confusion, and very little has been done to establish a uniform system of nomenclature throughout the different groups. The terms used in this paper are only tentative, and further study may show the desirability of changes. The parts of the genital structures in the genus *Sceliphron* have provisionally been designated as follows: (1) Basal ring (cardo), (2) claspers, (3) uncus, and (4) combined volsellae and sagittae.

The *basal ring* is narrow throughout, and especially so on the dorsal side. It surrounds the basal part of the genitalia.

The *claspers* are long and stout, and almost entirely enclose the other parts above. Dorsally and ventrally at the base, arms project inward; the dorsal arms seem to just about meet, and the ventral ones overlap. Near the tips of the claspers are a few scattered hairs.

Articulating with the dorsal basal arms of the claspers is a structure which I have tentatively termed the *uncus*, consisting of two structures loosely connected by a membrane three-fourths of their length. The distal portions, which are not connected by this membrane, are more heavily chitinized and are more or less curved or hook-shaped. Structures similar to this uncus in some Hymenoptera are termed by Radoskowski the "crotchets."

Ventral to the uncus, and arising near the ventral basal arms of the claspers is a structure, presumably consisting of the *volsellae* and *sagittae*, which have become more or less fused. Taken together, they are similar to a structure which Radoskowski calls the "bouclier". It consists of a large basal portion divided except at the very base, possibly representing the *volsellae* which have become partially united, and of two smaller structures fused to the inner distal edges of the *volsellae* and possibly representing the *sagittae*.

The genital structures except the claspers are concealed ventrally by the subtriangular venter of the eighth abdominal segment, which is partly telescoped under the venter of the seventh segment.

The genitalia have proved useful in determining specific relationships. Thus genitalia of the different forms here placed under

*caementarium* present no essential differences, supporting the belief that the whole series constitutes but a single species. Those of *fistulare* and *fasciatum* are plainly distinct. Those of *lucae* are somewhat similar to those of *caementarium*, but these two species are evidently distinct because of other differences. The genitalia of *assimilis* are distinct from those of *caementarium*, proving that *assimilis* is not a variety of *caementarium*, as it was considered by Kohl who described this form under the name *nicaraguanum*.

#### CLASSIFICATION AND ANALYTICAL KEYS

The genus *Sceliphron* belongs, according to Comstock<sup>2</sup>, to the Sphecinae, one of the six subfamilies into which his family Sphecidae is divided, but the subfamily Sphecinae of Comstock is equivalent to the family Sphecidae of Ashmead. For the present paper the classification of Ashmead is adopted, and the following key to the subfamilies of the family Sphecidae is that proposed by him<sup>3</sup> and later used by Fernald in his Digger Wasps of North America<sup>4</sup>; the groups here given subfamily rank are considered tribes by Comstock.

Following the key to the subfamilies is a key to the genera of the Sceliphroninae, also taken from Ashmead.<sup>5</sup>

#### KEY TO SUBFAMILIES OF SPECIDAE

1. Second cubital cell receiving only the first recurrent vein; the second recurrent vein received by the third cubital cell, or at least beyond the second transverse cubital. (Both recurrent veins are received by the first cubital cell in a few extra-limital forms)----- 2
- Second cubital cell receiving both recurrent veins, or the second recurrent vein is interstitial with the second transverse cubitus, although sometimes the first recurrent is interstitial with the first transverse cubitus or then received by the first cubital cell----- 3.
2. Antennae inserted on the middle of the face; claws with one to six teeth beneath; tibiae strongly spinous, or at least never with weak or feeble spines; tarsal comb in female present (except in *Isodontia*)  
Chlorioninae (Sphecinae Authors).
- Antennae inserted far anterior to the middle of the face; claws, simple, without teeth, or at most with a single small tooth near the middle; tibiae smooth, not spinous; tarsal comb in female never present----- Podiinae.
3. Claws simple, without a tooth beneath; tibiae more or less spinous, tarsal comb in female present; abdomen most frequently very elongate, the petiole composed of two segments, rarely of only one segment; cubital cell of hind wings usually originating beyond the transverse median vein.  
Sphecinae (Ammophilinae Authors).

<sup>2</sup> Comstock: An Introduction to Entomology, 1924. Classification of the family Sphecidae, pp. 962-972; account of subfamily Sphecinae on pp. 966-967.

<sup>3</sup> Ashmead: Can. Ent., vol. 31, 1899, pp. 347-352.

<sup>4</sup> Fernald: Digger Wasps of North America, Proc. U. S. Nat. Mus., vol. 31, 1906, p. 308.

<sup>5</sup> Ashmead: Can. Ent., vol. 31, 1899, p. 352.

Claws simple, with a single tooth beneath, although sometimes very minute, more rarely without a tooth; tarsal comb in female absent; abdomen always with a one-segmented petiole; cubital vein of hind wings interstitial or nearly so----- 4

4. Antennae inserted on the middle of the face; metathorax with a large U-shaped area above; mesopleura not longer than the height of the thorax,

*Sceliphroninae.*

Antennae inserted far anterior to the middle of the face, on or just above an imaginary line drawn from the base of the eyes; metathorax without a large U-shaped area above; mesopleura much longer than the height of the thorax----- *Podiinae.*

#### KEY TO THE GENERA OF THE SCELIPHRONINAE

Species black and yellow, not metallic; clypeus flat, at apex usually bidentate; transverse median nervure in front wings not interstitial with the basal nervure, but uniting with the median vein a little before the origin of the basal nervure; petiole of abdomen about twice as long as the median segment----- *Sceliphron* Klug.

Species metallic blue or violaceous; clypeus anteriorly tridentate; transverse median nervure in front wings interstitial with the basal nervure; petiole of abdomen not or scarcely longer than the median segment,

*Chalybion* Dahlbom<sup>6</sup>

#### Genus SCELIPHRON Klug

*Sceliphron* KLUG, Neue Schrift. Ges. naturf. Fr. Berlin, vol. 3, 1801, p. 561.

*Pelopoeus* LATREILLE, Hist. nat. Crust. Insect., vol. 3, 1802, p. 334.

*Genotype.*—*Sceliphron spirifex* (Linnaeus), designated by Bingham (1897, Fauna Brit. India, Hym., vol. 1, p. 235).

The genus *Sceliphron* was established by Klug in 1801, including under it the following five species: *spirifex* (*Sphex spirifex* Linnaeus), *madraspatanum* (*Sphex madraspatana* Fabricius), *lunatum* (*Sphex lunata* Fabricius), *cyanea* (*Sphex cyanea* Linnaeus), and *fuscum*, a new species. The fourth species, *Sphex cyanea* Linnaeus, had been placed in the genus *Chrysis* by Linnaeus in the twelfth edition of the Systema Naturae. The fifth species, described by Klug as *fuscum*, had already been described by Fabricius as *Sphex hemiptera*. None of these species was designated by Klug as the genotype, and for nearly 100 years the genus *Sceliphron* was without a designated type species.

The genus *Pelopoeus* was established by Latreille in 1802, giving as examples *Sphex spirifex* Linnaeus and *Sphex lunata* Fabricius, neither species being designated as the genotype. In 1810 Latreille<sup>7</sup>

<sup>6</sup> A study of the metallic blue mud-dauber wasps of the genus *Chalybion* Dahlbom was published in 1919 by Hutson (Trans. Amer. Ent. Soc., vol. 45, pp. 203-228, 1919), the species being placed by him in the genus *Sceliphron* Klug. Rohwer has since pointed out (Ent. News, vol. 32, p. 27, 1921) that the name *Sceliphron* Klug must be used for the black and yellow wasps of this group, because of the designation by Bingham (Fauna of British India, Hymen, vol. 1, p. 235, 1897) of *spirifex* Linnaeus as the genotype of *Sceliphron*. For the metallic blue species of mud-daubers, therefore, the name *Chalybion* Dahlbom must be used.

<sup>7</sup> Cons. Gen., p. 438.

gave *spirifex* as an "exemple" of the genus *Pelopoeus*, and by opinion 11 of the International Commission of Zoological Nomenclature these examples have been given the value of type designations.

In 1897, however, Bingham designated the same species, *spirifex* Linnaeus, as the type of the genus *Sceliphron*. These two genera, now having a common genotype, become synonymous, and *Pelopoeus*, described a year later than *Sceliphron*, must fall as synonym.

Kohl's revision placed the entire subfamily under the genus *Sceliphron*, *Chalybion* taking subgeneric rank, along with a group called *Hemachalybion*. To the writer the group of species ordinarily placed under *Sceliphron* (the black and yellow forms, with the long petiole) are sufficiently distinct from the other forms in the subfamily to merit generic rank, and they are so placed here.

#### KEY TO AMERICAN SPECIES OF *SCELIPHRON* KLUG

1. Tegulae and scape of antenna black-----*fasciatum* (Lepelletier).  
Tegulae and at least part of scape of antenna yellow----- 2.
2. Abdominal segments bordered with yellow----- 3.
3. Abdominal segments except first and rarely the second entirely black---- 4.
4. Yellow border of abdominal segments wide-----*luciae* (Saussure).  
Yellow border of abdominal segments narrow-----*jamaicensis* (Fabricius).
4. Propodeum definitely marked off below from metathorax by a deep groove.  
*fistulare* (Dahlbom).
- Propodeum not definitely marked off below from metathorax----- 5.
5. Hind legs with the basal portion of the tibiae and the greater portion  
of the tarsi yellow-----*caementarium* (Drury).  
Hind legs almost entirely black----- 6.
6. Females----- *figulum* (Dahlbom) or *assimile* (Dahlbom).  
Males ----- 7.
7. Clypeus with long, slender teeth-----*figulum* (Dahlbom).  
Clypeus with short teeth, of the usual form-----*assimile* (Dahlbom).

#### *SCELIPHRON CAEMENTARIUM* (Drury)

*Sphex caementaria* DRURY, 1770, Illustr. Nat. Hist., vol. 1, p. 105, female, male.

*Sphex flavomaculata* DEGEER, 1773, Mem. hist. Insect., vol. 3, p. 588, no. 4.

*Sphex lunata* FABRICIUS, 1775, Syst. Entom., p. 347.

*Sphex flavipes* FABRICIUS, 1781, Spec. Insect, p. 444.

*Sphex flavipunctata* CHRIST, 1791, Naturg. d. Insect., p. 301.

*Sphex affinis* FABRICIUS, 1793, Ent. Syst., vol. 2, p. 203, no. 21.

*Pelopoeus caementarius* WESTWOOD, Drury, 1837. Illustr. Nat. Hist., ed. 2, vol. 1, p. 99.

*Pelopoeus architectus* (Klug) LEPELETIER, 1845, Hist. nat. Insect. Hymen., vol. 3, p. 313, female.

*Pelopoeus servillei* LEPELETIER, 1845, Hist. nat. Insect. Hymen., vol. 3, p. 313, female.

*Pelopoeus solieri* LEPELETIER, 1845, Hist. nat. Insect. Hymen., vol. 3, p. 318, no. 18, female.

*Pelopoeus canadensis* SMITH, 1856, Cat. Hymen. Brit. Mus., vol. 4, p. 233, male.

*Pelopoeus nigriventris* COSTA, (1862) 1864, Ann. Mus. Zool. Napoli, vol. 2, p. 60.

Black and yellow, the amount of yellow being extremely variable. Legs always variegated with yellow; at least part of the scape of antennae and the tegulae invariably yellow; rest of body sometimes entirely black, and sometimes with a considerable amount of yellow.

*Female*.—Head: Frons slightly depressed; insertion of antennae slightly elevated; upper part of clypeus somewhat convex; clypeus bidentate or bilobed at apex, the lobes rounded; clypeus and frons except above antennae covered with a dense black to golden pubescence, and also numerous black to brown upright hairs; antennae slender, filiform, the segments having the following relative lengths—1/19, 2/5, 3/27, 4/22, 5/17, 6/15, 7/13, 8/12, 9/10, 10/10, 11/9, 12/10; scape mostly yellow, bulb often fuscous, remainder of antenna black, very minutely sericeous; mandibles very dark ferruginous to fuscous, slightly hairy toward the base, with longitudinal raised lines and furrows; frons above antennae and vertex not or only slightly pubescent, but with numerous erect black to brown hairs, sparsely punctate; gena and occiput weakly punctate, and covered with coarse, erect, black or brown hairs.

Thorax: Surface of prothorax punctate, covered with long, erect, black to golden hairs; dorsal surface sometimes with a yellow spot, which may be interrupted in the middle. Mesonotum black, hairy, densely punctate, and sometimes striate, lateral edges slightly reflexed from tegulae back; tegulae yellow; scutellum often with a yellow spot, longitudinally striate, hairy; pleural region just below the wing insertion often yellow; rest of mesopleural region black; whole mesopleural and mesosternal region hairy, punctate, sometimes minutely striate. Metathorax black, except the metanotum, which may have a median transverse yellow spot; upper part of metapleural region striate; the part just below almost entirely smooth and without hairs; posterior portion of the metathorax somewhat punctate and striate, not very definitely marked off above from the propodeum.

Propodeum: Black with often more or less yellow; sometimes with three spots of yellow—one at end of segment and one at each side just anterior to the spiracle; sometimes with two at the end of the segment; sometimes with only one or none; hairy, punctate and finely striate, the striations running obliquely up the sides and transversely across the dorsum.

Abdomen: Petiole smooth, nonpunctate or only very faintly punctate, minutely sericeous; black, yellow, or black dorsally and yellow ventrally; main portion of abdomen ovate, pointed at apex; black, except usually the first dorsal segment, which may have an irregular spot of yellow, or a smaller spot on each side, very rarely an indistinct spot of yellow on each side of second dorsal segment;

smooth, and no more than slightly sericeous except toward the posterior end, where it is sparsely hairy and punctate.

Legs: Anterior four; coxae black; trochanters black with a yellow apical rim on the posterior and inner side; femora black proximally, yellow distally; tibiae yellow; tarsi yellow at base, the outer segments becoming fuscous. Hind legs: Coxae black; trochanters usually black, rarely fuscous or ferruginous, with a yellow apical rim on inner side; femora black; tibiae yellow basally, black distally; tarsi yellow at base, the outer segments becoming fuscous. Coxae and trochanters of all legs sparsely hairy; entire surface of legs more or less sericeous; tarsal claws fuscous to ferruginous, with a minute tooth near the middle on the inner surface; spines on legs varying from yellow to fuscous.

Wings: Transparent with a yellowish to fuscous tinge; outer margins slightly infuscated; larger veins yellowish ferruginous to fuscous; wings often with a slight violet or purple reflection.

*Male*.—Differs from female as follows: Slightly smaller, abdomen shorter and less acute; teeth of clypeus more pointed. Genitalia figured in Figures 16, 17, and 18. Tips of uncus curve first downward and slightly outward, then taper abruptly and recurve nearly vertically again.

*Length*.—Female, 17 mm. to 26 mm.; male, 13 mm. to 23 mm.

*Habitat*.—North, Central, and Insular America, and also reported by Kohl from Tahiti and Honolulu, and by Cameron from Brazil. There are definite records from as far north as Quebec and Vancouver, and from as far south as the Barbadoes and Costa Rica.

*Types*.—The only type known to be in existence is that of Smith's *canadensis*, in the British Museum, where it was seen by Doctor Fernald in 1913.

This species seems to come closer to *assimile* and *figulum* than any other American species. *Sceliphron caementarium* always has at least the basal half of the hind tibiae and the basal two segments of the hind tarsi yellow; while *assimile* and *figulum* have the hind legs almost entirely black or fuscous, the tibiae having a slight yellow streak below basally, and the two or three basal segments of the tarsus sometimes becoming yellowish. Also, with *figulum* the teeth of the clypeus of the male are very elongate and narrow, which is not the case with *caementarium*. The male genitalia of *caementarium* are distinct from those of *assimile* and *figulum*.

It has already been mentioned that the amount of yellow present in this species is very variable. This has led to its description under a number of different names, some being designated as distinct species and others as varieties or subspecies. With a large series of specimens, taken from many parts of America, it has been possible

to show that the whole group is one species, though with a great amount of variation.

The amount of yellow present on the legs seems to be very nearly constant. The greater part of the scapes of the antennae and the tegulae are always yellow. The abdomen, except part of the first and very rarely part of the second dorsal segment is always black. The variation, then, occurs chiefly on the thorax, petiole, and first abdominal segment. Beginning with the form having the greatest amount of yellow, we have *servillei*, described by Lepeletier in 1845. In this form, the yellow is distributed as follows: The dorsal part of the prothorax, tegulae, a streak downward below the tegulae, scutellum, metanotum, a spot on each side of the propodeum anterior to the spiracles, a very large spot on the end of the propodeum, this sometimes very much extended forwards, the entire petiole, and almost all of the first dorsal abdominal segment; all of this in addition to the constant areas previously mentioned. In some individuals, the petiole, instead of being entirely yellow, has a fuscous streak on the dorsal side; in others the same area is black; in still others almost the dorsal half is black. Parallel with this has occurred a reduction in the size of the spots on the propodeum, those at the sides tending to disappear, and that on the end being much smaller. Such specimens were described as *caementarium* by Drury in 1770 and as *flavipunctata* by Christ in 1791. Next, the amount of yellow on the ventral side of the petiole gradually lessens, until this area becomes entirely black. Such individuals were described in 1773 by De Geer as *Sphex flavomaculata* and by Fabricius in 1775 as *Sphex lunata*.

From this point on, the reduction in the amount of yellow seems to take place in two principal regions—at the end of the propodeum and on the first dorsal abdominal segment. The spot at the end of the propodeum is very much reduced in size in some specimens; in some it is narrowed in the middle; and in still others it is divided, forming two small spots instead of one larger one. This form was described by Smith in 1856 as *canadensis*. In other cases the spot or spots at the end of the propodeum have disappeared entirely, giving a form which has not been described.

Other individuals which retain the spot at the end of the propodeum lose to a greater or less extent the yellow on the first dorsal segment of the abdomen. The lunate mark becomes divided in the middle, and the two spots thus formed may become reduced to mere dots, or disappear entirely. This variation was described in 1864 by A. Costa as *nigriventris*, and in 1845 by Lepeletier as *architectus*.

Parallel with the reduction in the amount of yellow on the propodeum and abdomen has occurred a similar reduction in the amount of yellow on the dorsal surface of the thorax and on the

mesopleura below the bases of the wings. When the yellow has all disappeared except that on the tegulae, we have the form described by Fabricius as *Sphex flavipes*. Saussure speaks of variations of *flavipes* in which there is present a yellow subalar mark and others in which the scutellum and metanotum may have yellow fasciae.

From a study of this series, it is evident that there is a gradual variation from the *servillei* form, with a large amount of yellow, down to the *flavipes* variation, with no yellow except on the legs, tegulae, and scapes of the antennae. While in a general way the forms with the greatest proportion of yellow are more common in the more southern localities, none of the different forms are restricted to any distinct region. No essential structural differences are found through the series. A detailed study of the male genitalia have shown them to be identical throughout the group. It is thus evident that the entire group consists of but one species, which was first described by Drury as *caementarium*.

#### SCELIPHRON ASSIMILE (Dahlbom)

*Pelopoëus assimilis* DAHLBOM, 1843, Hymen. Europ., vol. 1, p. 23, no. 7, female, male.

*Sceliphron caementarium* DRURY, var. *nicaraguanum* KOHL, 1918, Annalen des Naturhistorischen Hofmuseums Wien, vol. 32, p. 118.

Black and yellow, the yellow distributed as follows: Scapes of antennae, rorsal region of prothorax, scutellum, metanotum, tegulae, a streak below the tegulae, usually a spot on each side of the propodeum anteriorly and one at end, sometimes the ventral side of the petiole, an irregular spot or spots on first dorsal abdominal segment, and parts of legs.

*Female*.—Head: Frons slightly concave, insertion of antennae slightly elevated; anterior margin of clypeus bilobed or bidentate, the lobes rounded; clypeus and frons covered with a dense golden pubescence which is thinner or absent above antennae, and also with numerous black to golden upright hairs; antennae slender, filiform, the segments having the following relative lengths: 1/19, 2/4, 3/31, 4/23, 5/19, 6/15, 7/13, 8/12, 9/11, 10/10, 11/9, 12/10; scape yellow, bulb fuscous, remainder of antenna black, very minutely sericeous; mandibles very dark ferruginous to fuscous, slightly hairy towards base, with longitudinal lines and furrows; vertex, genae, and occiput not pubescent or only slightly so, but with numerous erect black to golden hairs, and weakly punctate.

Thorax: Dorsal region of prothorax with a large yellow spot; surface weakly punctate, covered with long erect; black to golden hairs. Mesonotum black, hairy, densely punctate, and somewhat striate, scutellum transverse, longitudinally striate, with a large yellow spot, hairy; tegulae yellow; area just below tegulae yellow, rest of



mesopleural region black; whole pleural and sternal region hairy, punctate, sometimes minutely striate. Metathorax black except metanotum, which has a linear transverse yellow spot; upper and anterior part of metapleural region striate, the part just below almost entirely smooth and without hairs; posterior part of metathorax somewhat punctate and slightly striate, not very definitely marked off above from the propodeum.

Propodeum: Hairy, punctate and striate; black, usually with three yellow spots, one on each side anterior to the spiracle, and one at the end above the petiole, this spot varying somewhat in size, but usually covering the entire end of the propodeum and extending forward a short distance along each side.

Abdomen: Petiole smooth, nonpunctate or only faintly punctate, minutely sericeous, black, sometimes with ventral part yellow to brown; main portion of abdomen ovate, pointed at apex, black except first dorsal segment, which usually has an irregular yellow area; smooth, and no more than slightly sericeous except the last dorsal and ventral segments, which are sparsely hairy and punctate.

Legs: Anterior four: coxae black, trochanters black with a yellow to brownish apical rim behind; femora black proximally, yellow distally; tibiae yellow; tarsi yellow at base, the outer segments becoming fuscous. Hind legs: almost entirely black; trochanters with yellow to brown apical rim on lower side; tibiae with yellow streak on lower surface basally; tarsi usually black, but sometimes fuscous, with first segment or two ferruginous below. Coxae and trochanters of all legs sparsely hairy; entire surface of legs more or less sericeous; tarsal claws fuscous, with a very minute tooth near the middle on the inner surface; spines on legs varying in color from yellow to fuscous.

Wings: Transparent with a yellowish or brownish tinge, often with a violet or purple reflection; outer margins slightly infuscated; larger veins ferruginous to fuscous.

*Male*.—Differs from female as follows: slightly smaller; abdomen shorter and less acute; teeth of clypeus a little longer and less broadly rounded than those of the female; sometimes a spot of yellow on the outside of the posterior trochanter.

Genitalia: Somewhat similar to those of *caementarium*, but the tips of the uncus taper and curve more gradually, the extreme tips pointing horizontally outward at about right angles to the main axis of the genital structures.

*Length*.—Female, 20 mm. to 25 mm.; male 17 mm. to 22 mm.

*Habitat*.—The extreme southern part of Texas, Mexico, Central America, the West Indies, and the northern part of South America. It is impossible to determine the exact southern limits of this species, since the females are indistinguishable from those of *figulum*, the

range of which probably extends farther south than that of *assimile*. The two species have been confused in the literature, which adds to the difficulty in determining the exact range of each.

*Types*.—The type of *assimile* was studied by Dr. H. T. Fernald at the University of Lund in 1913. Kohl makes no mention of the type of *nicaraguanum*, but his locality record reads "Nicaragua, Mus. Berol."

Notes made by Doctor Fernald on the type of *assimile* have greatly supplemented the original meager description, and have convinced the writer that the form under present consideration is the same as that described by Dahlbom under this name. *S. figulum* and *assimile* were both described by Dahlbom on the same page. The only difference noted was in the shade of the color of the wings and of the wing venation, which is wholly inadequate as a distinguishing character. While the original description of *figulum* gives the locality as "*Gallia meridionalis*," this was presumably an error, since in the key to the species on page 434 of the same volume the locality is given as America, and *figulum* has been very generally accepted as an American species. *Assimile* was first recorded as a Cuban species. While the two names, *figulum* and *assimile*, may have been originally used for the same form, it seems more likely that the specimens from which the description of *figulum* was prepared were the form next discussed in the present paper. In the uncertainty, it seems best to keep the name *assimile* for the only West Indian form to which these two descriptions could apply, since the type locality for *assimile* is Cuba, while that of *figulum* is unknown.

A study of the male genitalia of *assimile* show it to be undoubtedly distinct from *caementarium*, which is further evident from the constantly darker color of the posterior legs of both sexes of *assimile*. The form *nicaraguanum*, described by Kohl as a variety of *caementarium*, is evidently identical with *assimile*.

This species is undoubtedly distinct from *figulum*; sufficient evidence of this is offered by the unusual shape of the teeth of the clypeus of the male of the latter, which are long and slender, quite different from those of any other species of *Sceliphron*. I share Kohl's difficulty in distinguishing between the females of the two forms, and have been unable to find any constant difference.

#### SCELIPHRON FIGULUM (Dahlbom)

*Pelopoëus figulus* DAHLBOM, 1843, Hymen. Europ., vol. 1, p. 23, no. 6, female.

*Pelopoëus vindæ* LEPELETIER, 1845, Hist. Nat. Insect., Hym., vol. 3, p. 317, no. 17, male.

*Pelopoëus bimaculatus* LEPELETIER, 1845, Hist. Nat. Insect., Hym., vol. 3, p. 319, no. 19, female.

*Pelopoëus chilensis* SPINOLA, 1851, Hist. fis. Chile Zool., vol. 6, p. 395, no. 1, female, male.

Black and yellow, the yellow distributed as follows: Scapes of antennae, dorsal region of the prothorax, scutellum, metanotum, tegulae, a streak below the tegulae, usually a spot on each side of the propodeum and one at the end, sometimes the ventral half of the petiole, an irregular spot or spots on the first dorsal abdominal segment, and parts of the legs.

*Female*.—Head: Frons slightly concave, insertion of the antennae slightly elevated; anterior margin of clypeus bilobed or bidentate, the lobes rounded; clypeus and frons except above the antennae covered with a dense golden pubescence, and also numerous upright black to golden hairs; antennae slender, filiform, the segments having the following relative lengths: 1/19, 2/4, 3/26, 4/22, 5/17, 6/14, 7/12, 8/11, 9/10, 10/10, 11/9, 12/10; scape yellow, bulb fuscous, the remainder of antenna black, very minutely sericeous; mandibles very dark ferruginous to fuscous, slightly hairy toward the base, with longitudinal lines and furrows; frons above antennae, vertex, genae and occiput not or only slightly pubescent, but with numerous erect black to golden hairs, and weakly punctate.

Thorax: Dorsal region of prothorax with a large yellow spot; surface weakly punctate, covered with long, erect, black to golden hairs. Mesonotum black, hairy, densely punctate, and sometimes striate; scutellum transverse, with a large yellow spot, longitudinally striate, hairy; tegulae yellow; area just below tegulae yellow; rest of mesopleural region black; whole pleural and sternal region hairy, punctate, sometimes minutely striate. Metathorax black—except the metanotum, which has a linear transverse yellow spot; upper and anterior part of metapleural region striate; the part just below almost entirely smooth and without hairs; posterior part of metathorax somewhat punctate and striate, not very definitely marked off above from the propodeum.

Propodeum: Hairy, punctate, and striate; black, usually with three yellow spots—one on each side anterior to the spiracle, and one at the end above the petiole, this spot varying greatly in size, but usually covering the whole end of the segment and extending forward on the dorsum, leaving a central black band which in front widens to the full width of the dorsum. I have one specimen from Chile in which the propodeum is almost entirely black, suggesting the possibility of a variation similar to that occurring in *caementarium*.

Abdomen: Petiole smooth, nonpunctate, or only faintly punctate; minutely sericeous; black, sometimes with the ventral portion yellow; main portion of abdomen ovate, pointed at apex, black except the first dorsal segment, which has an irregular mark of yellow, sometimes interrupted in the middle; smooth, and no more

than slightly sericeous except the last dorsal and ventral segments, which are sparsely hairy and punctate.

Legs: Anterior four: Coxae black; trochanters black with a yellow apical rim behind; femora black proximally, yellow distally; tibiae yellow; tarsi yellow at base, the outer segments becoming fuscous. Hind legs: Almost entirely black; trochanters with a yellow apical rim on inner side, and sometimes with a small yellow spot on outside; tibiae with an inconspicuous yellow streak on lower surface basally; tarsi usually black, but sometimes fuscous with the first segment or two ferruginous below. Coxae and trochanters of all legs sparsely hairy; entire surface of legs more or less sericeous; tarsal claws fuscous, with a very minute tooth near the middle on the inner surface; spines on legs varying from yellow to fuscous.

Wings: Transparent with a yellowish tinge, often with a slight violet or purple reflection; outer margins slightly infuscated; larger veins ferruginous to fuscous.

*Male*.—Differs from female as follows: Slightly smaller; abdomen shorter and less acute; teeth of clypeus much more pointed and elongate than those of the female, and farther apart; these teeth are distinct in form from those of any other American species of this genus; pubescence on face silvery to golden; sometimes a yellow to brown spot is present on the outside of the posterior trochanters. One male from Chile lacks the anterior yellow spots on the propodeum, and the usually large area of yellow at the posterior end of the propodeum is reduced to three small spots, which suggests the possibility of a variation in this species similar to that occurring with *caementarium*; in other males the yellow area at the end of the propodeum extends over into the dorsal area.

Genitalia: Similar to those of *assimile*.

*Length*.—Female, 22 mm. to 28 mm.; male, 18 mm. to 23 mm.

*Habitat*.—Kohl records this species from numerous localities from Tampico, Mexico, southward through Central and South America, and makes one doubtful reference to a record from it from Cuba by De Saussure, which is the only record which he has from the West Indies. The writer has seen specimens from Para, Brazil, Sapucay, Paraguay, Bahia Blanca, Argentina, and from "Chile."

The probable proper applications of the names *figulum* and *assimile* and the difficulty in separating the two species have already been touched upon. If the type of *figulum* were available, it is possible that it might be found to be the same form as that here called *assimile*, in which case the latter name would have to be dropped in favor of *figulum*, and the form here called *figulum* would then be called *vindex*. It is, however, equally possible that Dahlbom used these names as they are used in this paper, and in the absence

of the information which a study of the type of *figulum* would give, the present disposition of the respective names seems the best possible, and is the same as used by Kohl in his revision.

The descriptions of *bimaculatus* and *vindeu* by Lepeletier are identical in almost every respect, and there is little doubt that these names are synonyms of *figulum*. As described by Spinola, *chilensis* differs from *figulum* only in having the propodeum entirely black instead of with three spots of yellow. In two specimens from Chile which the writer has studied, both male and female had a very small amount of yellow on the propodeum, represented by several faint spots at the posterior end, and none at the sides. A series would probably show a variation similar to that occurring with *caementarium*.

The differences between *figulum* and *caementarium* have already been noted. Superficially, *figulum* has also some resemblance to *fistulare*, but with the latter, the propodeum is marked off below by a deep, definite groove, and has six spots of yellow, neither of which features occur with *figulum*.

#### SCELIPHRON FISTULARE (Dahlbom)

*Pelopoeus fistularis* DAHLBOM, 1843, Hymen. Europe, vol. 1, p. 22, no. 8, 1845;

Hymen. Europe, vol. 1, p. 434, no. 17, female, male.

*Pelopoeus histrio* LEPELETIER, 1845, Hist. nat. Insect. Hymen., vol. 3, p. 316, no. 16, female, male.

Black and yellow; propodeum shining, strongly striate, and with six spots of yellow; pubescence golden; tarsal claws without a tooth; propodeum definitely marked off below from the metathorax by a deep groove.

*Female*.—Head: Frons "depressed, insertion of antennae slightly elevated; upper part of clypeus slightly convex; clypeus bidentate or bilobed at apex, the lobes rounded; frons except above antennae and clypeus covered with a dense golden pubescence, and also numerous erect golden hairs; antennae slender, filiform, the segments having the following relative lengths: 1/21, 2/4, 3/25, 4/21, 5/17, 6/14, 7/11, 8/10, 9/9, 10/9, 11/8, 12/10; scape yellow, bulb fuscous, remainder of antenna black, very minutely sericeous; mandibles very dark ferruginous to fuscous, without a tooth on the inner surface, slightly hairy toward the base; frons above antennae, vertex, genae, and occiput not or only slightly pubescent, but with numerous erect golden hairs, weakly punctate.

Thorax: Surface of prothorax weakly punctate, covered with long, erect, golden hairs; dorsal surface with a yellow spot; sometimes a spot at each side. Mesonotum black, hairy, densely punctate, minutely striate; scutellum with a large yellow spot, longitudinally striate, hairy; tegulae yellow; a streak below tegulae yellow;

rest of mesopleural region shining, black; whole mesopleural and mesosternal region hairy, punctate, but not striate. Metathorax smooth, or at most only very weakly and sparsely punctate; shining black, except the metanotum, which has a linear transverse spot of yellow; metathorax very definitely marked off above from the propodeum.

Propodeum: Shining black, hairy, not noticeably punctate, but quite strongly striate; with six spots of yellow—one on each side anterior to and extending backward below the spiracles, one on each side of the dorsum, and two at the end above the base of the petiole.

Abdomen: Petiole black, with a narrow yellow line on ventral surface; almost entirely smooth; first dorsal segment with a yellow area, which is larger at the sides, sometimes almost entirely yellow; rest of abdomen black, smooth, and no more than slightly sericeous, except the last dorsal and ventral segments, which are sparsely hairy and punctate.

Legs: Anterior four: Coxae black; trochanters black with a yellow apical rim posteriorly and on outside, often with a yellow spot on anterior surface; femora with a small area of black basally, remainder yellow; tibiae yellow; tarsi yellow, the outer segments becoming fuscous. Hind legs: Coxae black with a subquadrate spot of yellow behind and often another spot on opposite side, the two often meeting; trochanters black to fuscous, with sometimes an indefinite yellowish area; femora black to fuscous with a narrow line of yellow outside; tibiae fuscous, yellow below distally; tarsi fuscous. Coxae and trochanters very sparsely hairy; surface of legs more or less sericeous, that of tibiae and tarsi especially so; spines fuscous to ferruginous; tarsal claws fuscous, without a tooth.

Wings: Transparent with a yellowish to fuscous tinge; veins fusco-ferruginous; wings often with a slight violet reflection.

*Male*.—Differs from female as follows: Slightly smaller; abdomen shorter and less acute; teeth of clypeus pointed, not broadly rounded. One otherwise typical male with the middle pair of spots on the propodeum missing was noted.

*Genitalia*: Tips of uncus not much curved; blunt, not pointed. Sagittae, volsellae, and claspers somewhat similar to those of *caementarium* (pl. 4, figs. 19 and 20).

*Length*.—Female, 20 mm. to 24 mm.; male, 17 mm. to 21 mm.

*Habitat*.—Mexico, Central Insular, and South America. Cameron reports it as far north as Atoyac, Vera Cruz. The only records from Insular America are from Montserrat and St. Vincent. I have specimens from Para and Obidos, Brazil, and from Peru. How much farther south the range of this species extends I can not say.

*Types*.—The location of the types of this species is unknown.

## SCELIPHRON FASCIATUM (Lepeletier)

*Pelopoecus fasciatus* LEPELETIER, 1845, Hist. Nat. Insect. Hymen., vol. 3, p. 315, no. 15, female.

*Pelopoecus argentifrons* CRESSON, 1865, Proc. Entom. Soc. Philadelphia, vol. 4, p. 136, female.

Shining black, with pale yellow markings on thorax and first dorsal abdominal segment; pubescence and hairs silvery; legs black.

*Female*.—Head: Black; frons slightly depressed, insertion of antennae slightly elevated; upper part of clypeus somewhat convex, anterior edge reflexed, bidentate or bilobed, the lobes rounded; frons except above antennae and clypeus with a dense silvery pubescence and also with numerous erect silvery hairs; antennae black, faintly sericeous, the segments having the following relative lengths: 1/19, 2/4, 3/24, 4/18, 5/15, 6/13, 7/11, 8/9, 9/8, 10/7, 11/6, 12/7; mandibles fuscous, tips ferruginous, sparsely hairy towards the base; frons above antennae, vertex, genae, and occiput not or only slightly pubescent, but with numerous erect, silvery hairs, slightly punctate.

Thorax: Prothorax shining black, with two linear spots of yellow on the dorsal surface, one on each side of the median depression, weakly punctate, covered with white hairs. Mesonotum black, densely and finely punctate and striate, hairy; scutellum with a transverse yellow spot, longitudinally striate; an area just below tegulae yellow, rest of pleural region shining black; whole mesopleural and mesosternal region hairy, punctate, and striate. Metathorax black except a narrow transverse band of yellow on the metanotum; upper and anterior part of metapleural region almost smooth and with only a few minute white hairs; posterior part slightly punctate.

Propodeum: Shining black with a spot of yellow on each side anterior to the spiracles, and two sub-circular spots of yellow at apex, above the base of the petiole; minutely punctate and striate; covered with silvery hairs.

Abdomen: Petiole shining black, slightly hairy and sericeous; main portion of abdomen ovate, pointed at apex, black except the first dorsal segment, which has a yellow band on its posterior margin, broadening out at the sides; nonpunctate and not more than very slightly sericeous except the last dorsal and ventral segments, which are hairy and punctate.

Legs: Black; more or less silvery sericeous, the tarsi being especially so; coxae and trochanters, and sometimes the femora, sparsely hairy; tarsal claws dark ferruginous, with a minute tooth near the middle on the inner surface; spines on legs fuscous.

Wings: Transparent with a fuscous tinge; outer margins infuscated; veins fuscous; wings often with a slight violet or purple reflection.

*Male*.—Differs from female as follows: Anterior margin of clypeus nearly straight; anterior tibiae usually with an elongate yellow spot; middle tibiae often with a very small yellow spot; tarsal claws without a tooth.

Genitalia: Uncus slender, tips bent at right angles to main axis; volsellae broad (pl. 4, figs. 21 and 22).

*Length*.—Female, 19 mm. to 22 mm.; male, 17 mm. to 19 mm.

*Habitat*.—Isle of Pines, Haiti, and Cuba.

*Types*.—The location of Lepeletier's type is unknown. The type of Cresson's *argentifrons* is in the collection of the Entomological Society of Philadelphia.

Kohl appeared to be in doubt whether *fasciatum* and *argentifrons* were the same and chose to use the latter name. In both original descriptions the tegulae and all legs were noted as being entirely black. These characters constitute a departure from the usual condition among American species of *Sceliphron*. The writer has seen only one form in which these characters occur, and it seems evident that there is only one species involved.

#### SCELIPHRON JAMICENSIS (Fabricius)

*Sphex jamaicensis* FABRICIUS, 1775, Syst. Entom., p. 347, no. 10.

*Pelopoeus jamaicensis* FABRICIUS, 1804, Syst. Piez., p. 204, no. 6.

*Pelopoeus annulatus* CRESSON, 1865, Proc. Ent., Soc. Philadelphia, vol. 4, p. 135, female, male.

*Pelopoeus vindeus*, var. *annulatus* CRESSON, Saussure, 1867, Reise d. Novara Zool., vol. 2, pt. 1, Hymen., p. 32, female.

Black or fuscous and yellow, posterior margins of all segments yellow, pubescence and hairs yellow.

*Female*.—Head: Frons slightly depressed; insertion of antennae slightly elevated; upper part of clypeus somewhat convex; clypeus bilobed or bidentate at apex, the lobes rounded, frons except above antennae and clypeus covered with a dense golden pubescence and numerous erect golden hairs; antennae slender, filiform, the segments having the following relative lengths: 1/20, 2/5, 3/25, 4/20, 5/17, 6/14, 7/11, 8/10, 9/10, 10/9, 11/8, 12/9; scape yellow, bulb fuscous; second segment fuscous above, yellow below; third segment yellow basally below and at tip, rest fuscous; fourth and fifth segments sometimes with a little yellow at tip; rest of antenna black, very minutely sericeous; mandibles very dark ferruginous to fuscous, slightly hairy toward the base; frons above antennae, vertex,



genae, and occiput not or only slightly pubescent, but with numerous erect golden hairs, somewhat punctate.

**Thorax:** Surface of prothorax punctate, covered with long, erect, golden hairs; dorsal surface almost completely covered with a yellow spot, which usually extends downward on each side nearly to the coxa. Mesonotum black, hairy, densely punctate, minutely striate; scutellum with a large transverse yellow spot, longitudinally striate; tegulae yellow; an area just below the tegulae yellow; rest of mesopleural region black; whole mesopleural and mesosternal region hairy, punctate, sometimes minutely striate. Metathorax black except the metanotum, which has a transverse yellow spot; upper and anterior portion of metapleural region almost entirely smooth and without hairs; posterior portion of metathorax not very definitely marked off above from the propodeum.

**Propodeum:** Black, with three yellow spots—one on each side at the anterior end, each of these extending posteriorly and downwards to a point; and one at the end of the propodeum extending forwards on the dorsum, leaving a central black band, which in front widens to the full width of the dorsum; surface of propodeum punctate and finely striate.

**Abdomen:** Petiole smooth, nonpunctate or nearly so; minutely sericeous; black dorsally and yellow ventrally, the limits of the two colors varying greatly; main portion of abdomen ovate, pointed at end; first segment yellow, with a fuscous stain above petiole; rest of segments fuscous to black, posterior margins yellow; surface smooth, no more than slightly sericeous except the last dorsal and ventral segments, which are sparsely hairy and punctate.

**Legs:** Anterior four: Coxae black; trochanters black with a yellow apical rim on outside; femora black basally, the remainder yellow; tibiae yellow; tarsi yellow at base, the outer segments becoming fuscous. Hind legs: Coxae black; trochanters yellow with a fuscous apical rim; femora yellow basally, the remainder black; tibiae yellow basally, black distally; tarsi yellow and fuscous, first segment usually fuscous at base and apex, the others yellow at base and fuscous at apex, outer segments becoming entirely fuscous. Coxae and trochanters of all legs very sparsely hairy; entire surface of legs more or less sericeous; tarsal claws fuscous, with a minute tooth near middle on the inner surface; spines on legs varying from yellow to fuscous.

**Wings:** Transparent, with a yellowish to ferruginous tinge; outer margins slightly infuscated; wings sometimes with an extremely slight violet or purple reflection.

**Male.**—Differs from female as follows: Slightly smaller; abdomen shorter and less acute; teeth of clypeus more pointed than in female;

anterior portion of scape, first segment of filament, lower side and tip of second segment, yellow to ferruginous.

*Length*.—Female, 19 mm. to 23 mm.; male, 20 mm. (one specimen).

*Habitat*.—Haiti, the Bahamas, Cuba, Jamaica.

*Types*.—The location of Fabricius's types is unknown. That of Cresson's *annulatus* is in the collection of the Entomological Society of Philadelphia.

As this species seems to be the only one from Jamaica or the West Indies in which the segments of the abdomen are bordered with yellow, there seems to be little doubt that it was the one described by Fabricius as *jamaicensis*. He does not mention the presence of yellow on the petiole, but that feature may have been overlooked, or he may have described from specimens in which the petiole was entirely black, which would have been quite possible considering the variation which occurs elsewhere in this genus. This species is somewhat similar to *lucae*, but with the latter species the yellow borders of the abdominal segments are much wider. The two are also very widely separated geographically.

#### SCHELIPHRON LUCAE (Saussure)

*Pelopoëus lucae* SAUSSURE, 1867, *Reise de Novara Zool.*, vol. 2, pt. 1, Hymen., p. 30, no. 1, female, male.

Black and yellow, posterior margins of all abdominal segments with a broad band of yellow; pubescence and hairs yellow.

*Female*.—Head: Frons slightly depressed, insertion of antennae slightly elevated; upper part of clypeus somewhat convex; clypeus bidentate or bilobed at apex, the lobes rounded; frons except above antennae and clypeus covered with a dense golden pubescence and numerous erect golden hairs; antennae slender, filiform, the segments having the following relative lengths: 1/24, 2/5, 3/27, 4/24, 5/18, 6/15, 7/12, 8/12, 9/11, 10/10, 11/9, 12/9; scape yellow, bulb fuscous, second segment yellow, third segment fuscous above, yellow below; rest of antennae black, minutely sericeous; mandibles ferruginous to fuscous, sparsely hairy near base; frons above antennae, vertex, genae, and occiput not or only slightly pubescent, but with numerous erect golden hairs, weakly punctate.

Thorax: Surface of prothorax weakly punctate, covered with long, erect, golden hairs; dorsal surface almost completely occupied by a yellow area; sides of prothorax with another yellow spot. Mesonotum black, hairy, densely punctate, minutely striate; scutellum with a large transverse yellow spot, longitudinally striate; tegulae yellow; an area just below the tegulae yellow; rest of mesopleural region black, except rarely a few small spots of brown; whole mesopleural and mesosternal region hairy, punctate. Metathorax black except the metanotum, which has a transverse yellow spot; upper and

anterior portion of métapleural region nearly smooth and without hairs; posterior portion not very definitely marked off above from the propodeum.

Propodeum: Black with three yellow spots—one on each side at anterior end, each of these extending downward and posteriorly to a point, and one at the end of the propodeum extending forwards on both sides of and extending over on the dorsum; propodeum punctate, finely striate, and hairy.

Abdomen: Petiole smooth, nonpunctate, minutely sericeous in places, yellow to ferruginous; abdomen long, ovate, pointed at apex; first segment yellow, with a fusco-ferruginous stain above petiole; rest of segments black anteriorly, yellow posteriorly, smooth, and no more than slightly sericeous except the last dorsal and ventral segments, which are sparsely hairy and punctate.

Legs: Anterior four: Coxae black, often ferruginous at tip; trochanters ferruginous; femora ferruginous at base to yellow at tip; tibiae yellow; tarsi yellow, the outer segments becoming ferruginous. Hind legs: Coxae black, ferruginous at tip; trochanters ferruginous; femora ferruginous at base, the rest fuscous to black; tibiae yellow, black distally; tarsi yellow, the outer segments probably becoming ferruginous or fuscous (only two specimens were available, and both of these lacked the last two tarsal segments). Coxae and trochanters very sparsely hairy; entire surface of legs more or less sericeous; tarsal claws ferruginous, with a minute tooth near the middle on the inner surface; spines on legs varying from yellow to fuscous.

Wings: Transparent with a ferruginous tinge; outer margins slightly infuscated; wings sometimes with an extremely slight violet reflection.

*Male*.—Only one male was available for study, and that one was extremely small, and may have been abnormal in other respects. Differed from female as follows: Petiole entirely black; teeth of clypeus more pointed; abdomen shorter and less acute.

Genitalia: Practically the same as those of *caementarium* (figs. 16, 17, and 18).

*Length*, female, 20 mm. to 24 mm.; male, 14 mm. (As already mentioned, only one male was available for study, and this one was probably unusually small.)

*Habitat*.—California, Lower California.

*Type*.—Probably in the Saussure collection at Geneva.

#### UNIDENTIFIED AND OTHER SPECIES

The following species have been described as occurring within the geographical limits of this paper, but have been unrecognized or should be placed in other genera.

SCELIPHRON ARGENTIPILE (Provancher)

*Pelopoëus argentiipilis* PROVANCHER, 1887, Addit. faun. Canada, Hymen., p. 256, female.

An examination of the type at Quebec by the late F. W. L. Sladen at the request of the late Dr. C. Gordon Hewitt proved it to be not a *Sceliphron*, but presumably a *Sphex*.

SCELIPHRON FUSCUM (Lepeletier)

*Pelopoëus fuscus* LEPELETIER, 1845, Hist. Nat. Insect, Hymen., vol. 3, p. 311, no. 9, female.

The habitat of this form is unknown. I have been unable to recognize the species, and it probably does not occur in America. Whatever its identity, the name *fuscum* must be rejected, it having been previously used by Klug for one of the species originally included in the genus *Sceliphron*.

SCELIPHRON PETIOLATUM (Drury)

*Sphex petiolatus* DRURY, 1773, Illustr. Nat. Hist., vol. 2, p. 75, pl. 39, fig. 7.

*Pelopoëus petiolatus* WESTWOOD, Drury, 1837, Illustr. Nat. Hist., Ed. 2<sup>a</sup>, vol. 2, p. 85, pl. 39, fig. 7.

This species was described by Drury from Jamaica, but it has been unrecognized since, and I have been unable to place it. From a study of Drury's description and plates I judge that this species is not a *Sceliphron*.

EXPLANATION OF PLATES

[From drawings made by the author]

PLATE 1

FIG. 1. Dorsal view of thorax of female *Sceliphron caementarium* (Drury).

2. Side view of thorax and abdomen of female *caementarium*.

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|--|--|
| <i>a</i> , prothorax.                              | <i>d</i> <sub>2</sub> , side of propodeum.     |
| <i>a</i> <sub>1</sub> , prothoracic lobe.          | <i>d</i> <sub>3</sub> , end of propodeum.      |
| <i>ac</i> , anterior coxa.                         | <i>d</i> <sub>4</sub> , spiracle in propodeum. |
| <i>b</i> <sub>1</sub> , mesonotum.                 | <i>f</i> , funiculus.                          |
| <i>b</i> <sub>2</sub> , scutellum.                 | <i>fw</i> , fore wing.                         |
| <i>b</i> <sub>3</sub> , prepectus.                 | <i>hw</i> , hind wing.                         |
| <i>c</i> <sub>1</sub> , metanotum.                 | <i>mc</i> , middle coxa.                       |
| <i>c</i> <sub>2</sub> , anterior portion of meta-  | <i>p</i> , petiole.                            |
| thorax.  | <i>pc</i> , posterior coxa.                    |
| <i>c</i> <sub>3</sub> , posterior portion of meta- | <i>s</i> , spiracle in 1st dorsal ab-          |
| thorax.  | dominal segment.                               |
| <i>d</i> <sub>1</sub> , dorsum of propodeum.       | <i>t</i> , tegula.                             |

3. Front view of head of female *caementarium*.

4. Tarsal claw of *caementarium*.

5. Tarsal claw of *fistulare*.

## PLATE 2

FIG. 6. Wings of *caementarium* with the veins named according to the usual nomenclature.

<i>a</i> , anal.	<i>re</i> <sub>1</sub> , 1st recur-	<i>tc</i> <sub>1</sub> , 1st trans-
<i>ax</i> , axillary.	rent.	verse cubi-
<i>b</i> , basal.	<i>re</i> <sub>2</sub> , 2nd recur-	tal.
<i>c</i> , costal.	rent.	<i>tc</i> <sub>2</sub> , 2nd trans-
<i>cu</i> , cubital.	<i>s</i> , stigma.	verse cubi-
<i>d</i> , discoidal.	<i>sc</i> , subcostal.	tal.
<i>f</i> , fold.	<i>sδ</i> , subdiscoi-	<i>tc</i> <sub>3</sub> , 3rd trans-
<i>ff</i> , frenal fold	dal.	verse cubi-
<i>fh</i> , frenal	<i>st</i> , sinus.	tal.
hooks.	<i>tc</i> , transverse	<i>tm</i> , transverse
<i>m</i> , median.	cubital.	median.
<i>r</i> , radial.		

7. Wings of *caementarium* with the cells named according to the usual nomenclature.

<i>a</i> , anal.	<i>cu</i> <sub>1</sub> , first cubital.	<i>d</i> <sub>2</sub> , second discoidal.
<i>ap</i> <sub>1</sub> , first apical.	<i>cu</i> <sub>2</sub> , second cubital.	<i>d</i> <sub>3</sub> , third discoidal.
<i>ap</i> <sub>2</sub> , second apical.	<i>cu</i> <sub>3</sub> , third cubital.	<i>m</i> , median.
<i>c</i> , costal.	<i>cu</i> <sub>4</sub> , fourth cubital.	<i>r</i> , radial.
<i>cu</i> , cubital.	<i>d</i> <sub>1</sub> , first discoidal.	<i>sm</i> , submedian.

8. Tip of anterior tibia and base of first tarsal segment of *caementarium* showing cleaning apparatus.9. Tip of posterior tibia and base of first tarsal segment of *caementarium* showing cleaning apparatus.

## PLATE 3

FIG. 10. Clypeus of male *caementarium*.11. Clypeus of female *caementarium*.12. Clypeus of male *fasciatum*.13. Antenna of female *caementarium*.

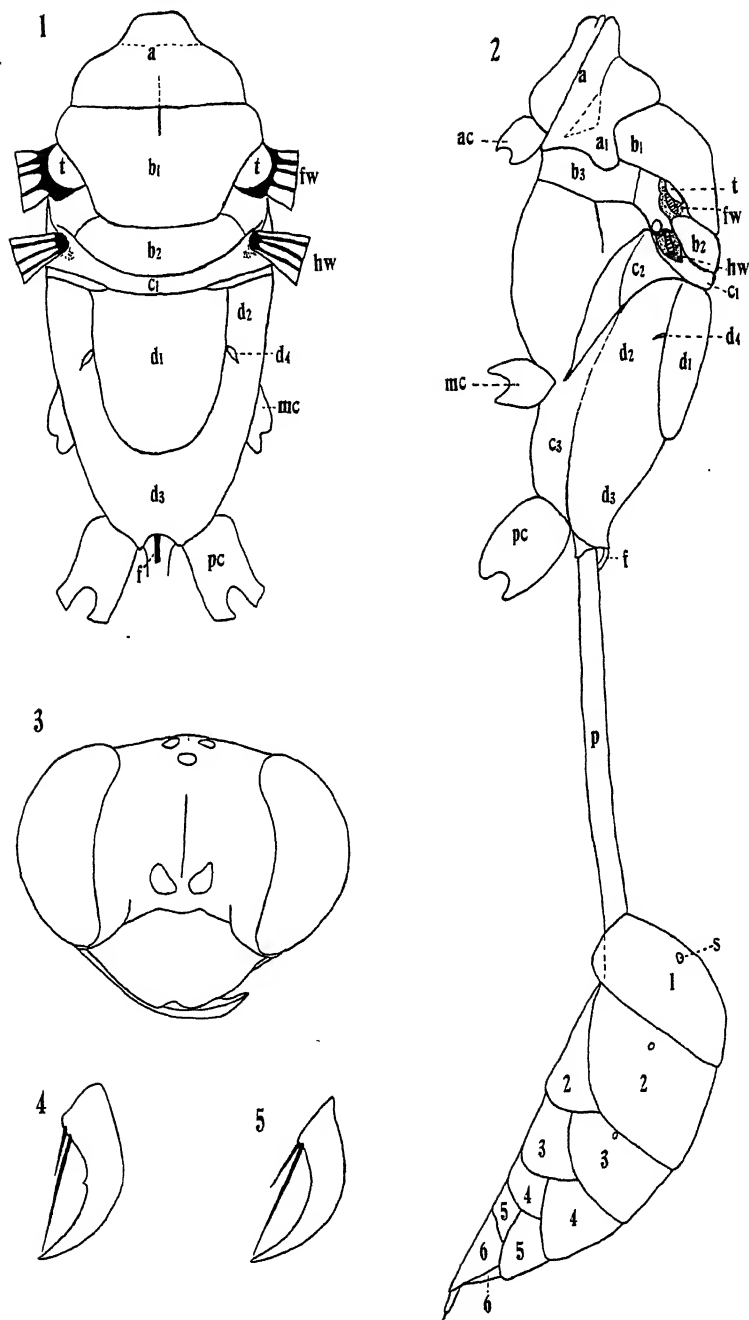
<i>b</i> , bulb.	<i>p</i> , pedicel.
<i>fl</i> , filament.	<i>s</i> , scape.

14. Mandible of male *caementarium*.15. Mandible of female *caementarium*.16. Ventral view of genitalia of male *caementarium*

<i>cla</i> , clasper.	<i>u</i> , uncus
<i>co</i> , basal ring.	<i>vo</i> , volsella
<i>sa</i> , sagitta.	

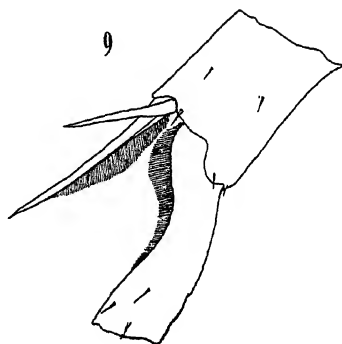
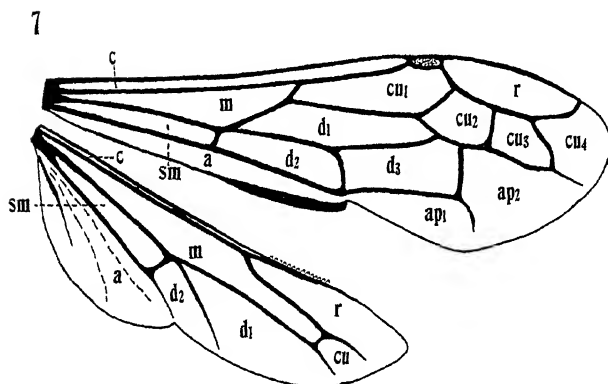
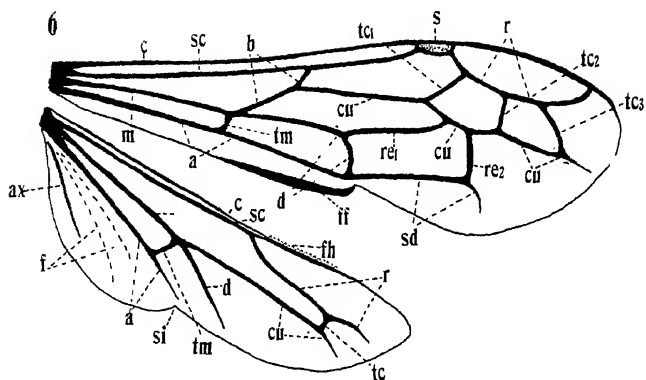
## PLATE 4

FIG. 17. Uncus of *caementarium*.18. Volsellae and sagittae of *caementarium*.19. Volsellae and sagittae of *fistulare*.20. Uncus of *fistulare*.21. Uncus of *fasciatum*.22. Volsellae and sagittae of *fasciatum*.



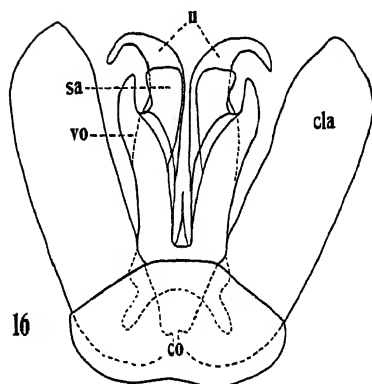
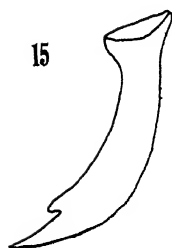
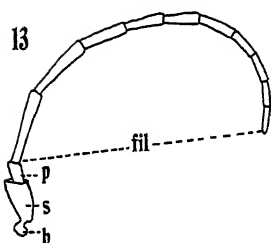
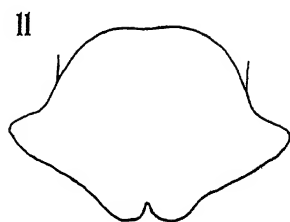
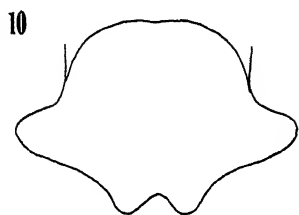
DETAILS OF SCELIPHRON WASPS

FOR EXPLANATION OF PLATE SEE PAGE 21



DETAILS OF SCELIPHRON WASPS

FOR EXPLANATION OF PLATE SEE PAGE 22

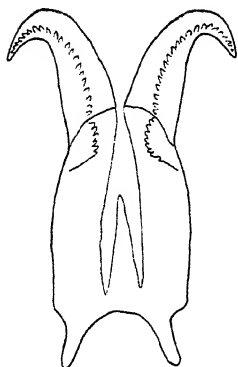


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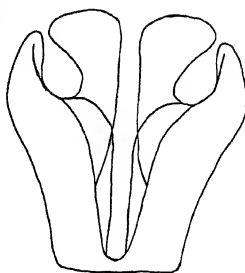
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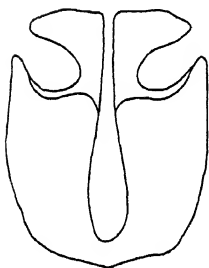
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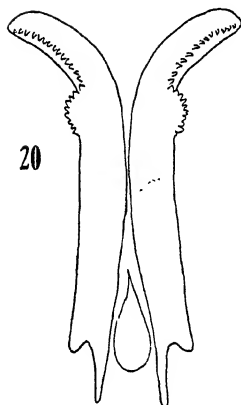
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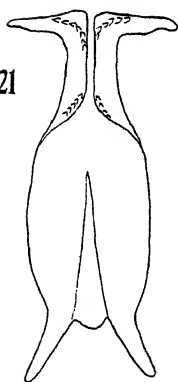
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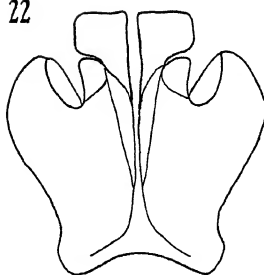
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DETAILS OF SCELIPHRON WASPS

FOR EXPLANATION OF PLATE SEE PAGE 22





# DESCRIPTIONS OF LARVAE AND PUPAE OF TWO-WINGED FLIES BELONGING TO THE FAMILY LEPTIDAE

By CHARLES T. GREENE

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This paper contains descriptions of 7 species of larvae and 11 species of pupae of flies belonging to the dipterous family Leptidae. It is based on a study of the material representing larvae and pupae of this family in the collections of the United States National Museum, supplemented by certain specimens which have kindly been lent to me by C. W. Johnson, of the Boston Society of Natural History. The specimens used in this paper are labeled with the number herein given to the species and with a reference to the number of this article.

Various authors have divided the group as here treated into three families—Leptidae, Xylophagidae, and Coenomyidae—but after a careful study of the immature stages I am convinced that they represent only one family group, and to this the name Leptidae should be applied. In my studies of the immature stages of Diptera I have found that the form of the spiracle in the pupa is constant for each family. Should this group be divisible into three families one would expect to find three distinct forms of spiracles, but in the material available only one type occurs, which very strongly confirms my impression that these insects do not belong to more than one family.

The adults of the family Leptidae vary in size from small to large and robust species. Their flight is rather slow, and the majority of them are found flying about foliage along the edge of woods and shady places. Some few species, however, are frequently found resting on tree trunks or old logs. The species of the genera *Rhachicerus*, *Xylomyia*, and *Xylophagus* very closely resemble certain ichneumon flies belonging to the order Hymenoptera. None of the adults of this family are injurious to man, although many species of the genus *Symphoromyia* are annoying, because they persistently fly about the heads of men and animals, and one or two species have been reported as actually sucking the blood. The habits of the larvae are varied. Many are predacious and some are scavengers.

A brief summary of the habits of the larvae of each species is given under the species. The larvae show many more variations in form and structure than do the pupae, and I think that this is probably explained by their adaptation to the more various ecological situations.

The principal character used in the description of the larvae and pupae is the spiracular plate, and from an examination of all the material before me this seems to be a very constant character. The spiracular plates in all of the species, except that belonging to the genus *Vermileo*, are very similar, and in all the spiracular entrance, or so-called spiracular opening, closely resembles the script capital letter "E." There is, however, sufficient variation in the location, form, and size of the spiracles to offer very useful diagnostic characters.

Some of the principal characters used are the following:

*Spiracular entrance* (pl. 2, fig. 9r).—This term means the main spiracular opening which contains numerous small openings called the slits.

*Peritreme* (pl. 2, fig. 9q).—By this term is here meant chitinous ridge or elevation which directly limits the spiracular entrance.

*Basal*.—This term means the end of the abdominal segment toward the thorax.

The material available make it possible to prepare the following family diagnosis:

*Larva*.—Generally cylindrical, smooth, white to pale yellow and with or without prolegs; head pointed and heavily chitinized or only partially chitinized; posterior spiracles located on the surface and no posterior cavity. Or the larva is depressed, gray-brown in color, the entire surface covered with scale-like plates; posterior spiracles in a cavity which opens transversely but generally is closed and forms a linear depression.

*Pupa*.—Typically orthorrhaphous in form with the antennal capsules large and located on the anterior edge of the head; these capsules are free from the head on their apical half or more. Or the antennal capsules may be small, slightly raised on the surface of the head, giving to the head the appearance of being bent downward. The spiracular plates closely resemble each other but vary in size from quite small to large.

#### LARVAE

##### TABLE OF SPECIES

1. Larva entirely chitinized and slightly flattened; surface reticulate.

(No. 1) *Xylomyia pallipes* Loew.

Larva not as above.....	2
2. Head elongated, pointed, heavily chitinized.....	3
Head not as above.....	5

3. Chitin on the dorsum of the first segment shaped like small amoebae.

(No. 2) *Rhachicerus nitidus* Johnson.

Chitin on the dorsum punctate----- 4

4. Chitin on the first two segments only; posterior spiracles elliptical in shape as in figure 3*h*----- (No. 3) *Xylophagus lugens* Loew.

Chitin on the first three segments; posterior spiracles oval in shape as in figure 4*j*----- (No. 4) *Xylophagus abdominalis* Loew.

5. Larva with prolegs on all the abdominal segments; two plumose caudal appendages----- (No. 5) *Atherix variegata* Walker.

Larva not as above----- 6

6. With several large bristles near the caudal end which have hooks at the apex; head capsule large----- (No. 6) *Vermileo comstockii* Wheeler.  
Not as above but with four lobes at the caudal end.

(No. 7) *Chrysopila*, species.<sup>1</sup>

#### PUPAE

##### TABLE OF SPECIES

1. Outer puparium shaped like the larva; transparent pupal skin always protruding from the dorsal exit hole----- (No. 1) *Xylomyia pallipes* Loew.

Puparium not shaped like the larva----- 2

2. From a dorsal view, the antennal capsules are at the anterior end of the head----- 3

From a dorsal view, the antennal capsules are below the anterior end of the head----- 5

3. With processes at the antero-basal portion of the antennal capsules--- 4

Without antennal processes; antennal capsules free; a circlet of long hairs on the dorsal side of the eye; spiracles as in figure 8.

(No. 8) *Xylophagus abdominalis* Loew.

4. Antennal processes pointed and directed outward; spiracles as in figure 9----- (No. 9) *Xylophagus lugens* Loew.

Antennal processes flattened and directed forward, inner apical points touching; spiracles with bead-like slits as in figure 10.

(No. 10) *Rhachicerus nitidus* Johnson.

5. Head small; abdomen tapering posteriorly to a point; spiracles very small; anterior thoracic spiracle with a large spine below; abdominal spiracles reniform with four radiating pale lines, see figure 11.

(No. 11) *Vermileo comstockii* Wheeler.

Head large; sides of abdomen nearly parallel----- 6

6. Anterior portion of head with a very large rugose prominence; puparium very large and robust; spiracles as in figure 12.

(No. 12) *Coenomyia ferruginea* Scopoli.

Head without the prominence----- 7

7. Spiracles located on large flattened chitinous plates as in figure 13.

(No. 13) *Leptis mystacea* Macquart.

Spiracles not on a flattened plate----- 8

8. Spiracles quite small; slits arranged in pairs with light-colored spaces between as in figure 14----- (No. 14) *Chrysopila quadrata* Say.

Spiracles larger and more normal in size----- 9

9. Spiracular plate rounded----- 10

Spiracular plate elongate elliptical as in figure 15.

(No. 15) *Chrysopila fasciata* Say.

<sup>1</sup> This species is either *Chrysopila ornata* or *thoracica*.

10. Spiracular plate quite large as in figure 16; puparium with two small bristles in the middle of the thoracic dorsum.

(No. 16) *Chrysopila foeda* Loew.

- Spiracular plate smaller, of medium size, as in figure 17; puparium with four small bristles in the middle of the thoracic dorsum.

(No. 17) *Chrysopila ornata* Say.

## DESCRIPTIONS OF SPECIES

### XYLOMYIA PALLIPES Loew

#### Plate 1

*Habits*.—Larvae are usually scavengers and may occasionally be predacious. They have been found under the bark of fallen cottonwood trees (*Populus*) and also under the bark, and in the fermenting sap in wounds, of tulip poplar (*Liriodendron*).

*Larva* (fig. 1).—Small; dull, dark yellowish brown; head pointed; body transversely elliptical; sides parallel; 11 segments, in addition to the head, of nearly equal length; the last segment slightly longer and rounded apically; surface of body reticulate except for a large bare area on the dorsum of the first segment and a smaller area on the second; dorsal anterior surface of head terminates anteriorly into a sharp process; on the side of the head, below the apex, is the minute two-jointed thimble like antenna with the apical joint much smaller; near the basal outer angle of head is a small yellow bristle; near each dorso-anterior angle of segments 2 to 10 is a depression; segments 4 to 11 have a transverse, anterior row of small, round depressions, those of the last segment are larger; segment 1 has two bristles at each anterior corner; segments from 1 to 10 have a dorsal pair of bristles just back of the transverse middle line and the segments from 2 to 11 have one lateral bristle; at each posterior angle of the last segment is a small bristle; on the venter, all segments except the last have a pair of widely separated bristles; along the ventral segmental line of the last segment are four bristles, the two middle ones the smaller; just back of the middle is a transverse row of four bristles, between this row and the apex of the segment are two bristles; anal opening surrounded by a rounded ridge. Anterior spiracle (fig. a) on the side of the first segment; it is heavily chitinized, dark yellowish red, the anterior end much darker; the narrow, distinctly elevated ridges are pale yellow. The posterior end of the larva opens transversely like a mouth, and within the lips, which are yellowish brown chitinized, smooth and shining, is a central depressed plate with a rounded ridge around the edge; in the middle of this plate is a rounded elongate elevation with six small, rounded punctures on each side, in the upper part are two transverse rows of small, rounded punctures and at each of its lower corners are situated

the posterior spiracles (fig. *b*); these spiracles are yellowish brown, nearly circular, with a broad flat peritreme which is divided into about 32 equal parts, nearly rectangular and separated from each other by very fine grooves; inside of the peritreme is a large depressed area with a roughly granular surface and in the center of this depression is a dark brown, small, smooth, circular area.

Length, 9 mm.; width, 2 mm.; thickness, 1.4 mm.

Arlington Farm, Va. Larvae and pupae from *Robinia podagrica*, reared March 12, 1906, by A. D. Hopkins. Hopk. U. S. No. 6062.

*Pupa* (fig. 1).—Very thin, shining, transparent, with a yellowish tinge. Antennal capsules large, pointing outward, faintly annulated to the tip; just posterior to the base of these are three faint ocellar punctures. Thorax slightly longer than wide, smooth; wing pads smooth, reaching to the apex of the third abdominal segment; thoracic spiracle (fig. *c*) situated on a small elevation; the spiracular entrance is golden yellow, sinuous, and contains a great number of short radiating slits. Abdomen cylindrical, composed of eight segments; first and last segment without any spines; segments 2 to 7 with a transverse, dorsal row of reddish yellow spines just posterior to the middle of the segment; segments 1 to 7 have a spiracle (fig. *d*) on the antero-lateral surface; spiracle small, golden yellow, slightly elevated; last segment rounded at apex and entirely smooth.

Length, 6 mm.; diameter of thorax, 1.85 mm.; diameter of abdomen, 1.75 mm.

#### RHACHICERUS NITIDUS Johnson<sup>2</sup>

##### Plates 1 and 2

*Habits*.—Larvae are predacious, and were found in the decayed trunks of sycamore trees which were lying on the ground.

*Larva* (fig. 2).—Small, ivory white, cylindrical; head elongated, pointed, dark yellowish red, heavily chitinated, with three pairs of bristles, one pair near the apex, one pair near the middle, and one pair near the base; there are 11 segments in addition to the head; segments from 1 to 5 short and of equal length; segments 6 to 11 a little longer than the preceding segments and of equal length; encircling each segmental line is a row of small, round yellow spots. Anterior spiracle (fig. *e*) is located posteriorly on the side of the first segment; it is nearly elliptical, reddish yellow, and around the edge shining; the middle is depressed and granular, and at the anterior end of the depression are six small elongated tubercles pointing backward. On the dorsum of segment 1 is a small triangle

<sup>2</sup> It is of interest to notice the difference in the texture of the chitin in the closely allied genera *Rhachicerus* and *Xylophagus*.



of reddish yellow chitin which is composed of small amoebalike pieces. Caudal plate is reddish yellow, large, nearly round and terminating in a broad bifid projection with two pointed prongs, which are well separated and curved upward; each prong has three bristles; on the ventral side at the base of this caudal projection is a pair of large bristles; in the middle of the caudal plate is a faint depression in which are several small, rounded punctures and a row of four similar punctures on each side; near the base of the plate are the posterior spiracles (fig. *f*); they are round, slightly elongate, and darker red, with the middle part faintly depressed and surrounded by a narrow, serrated, light-colored band; in the center of the depression is a small black crescent band; anterior to the spiracles is a pair of bristles and on each side are two bristles. Venter of first segment has on each side a triangle of chitin like that on the dorsum; between segments 3 and 4, and between all of the following segments to between 9 and 10, is a roughened transverse band of small reddish spines. Anal opening elongate, surrounded by a narrow darkened linear depression which has a V-shaped arm on each side.

Length, 9 mm.; diameter, 1.4 mm.

Rosslyn, Va., April 25, 1913, in rotton log, R. C. Shannon, collector. Great Falls, Va., April 12, 1924, larvae in log of sycamore, pupated May 11, 1924, adults emerged May 25, 1924, C. T. Greene, collector.

*Pupa* (fig. 10).—Pale to dark reddish yellow; nearly opaque; head and thorax more shining than the abdomen, which is cylindrical and rather dull. The antennal capsules are more reddish than the head, annulated and enlarged at bases; a deep rugose depression occurs between the bases of the antennal capsules; a small yellow bristle directed forward is situated near the anterior portion of each of them, and on their anterior edge is a large keel-shaped, rugose, inwardly directed projection, both projections touching each other, and generally there is an opening between them, but sometimes not; head is rounded and bears three deep, circular, ocellar punctures; on the side of each posterior ocellus is a small bristle-like hair. Thorax much longer than wide; near the anterior dorsal end is a sinuous row of small rounded punctures which are much larger laterally; at the anterior angles of the thorax are the prothoracic spiracles (fig. *s*) which are of a very deep reddish color; the slits in the entrance place are rounded, bead-like, and pale yellow. The abdomen is composed of eight segments, the first segment about half as long as the second and the segments from 2 to 7 about equal in length; dorsum of segment 1 has a transverse row of four pairs of bristles near the transverse median line, and segments from 2 to 7 have two

transverse widely separated rows of spines; in the posterior row the spines are larger and some have a hair-like termination; each segment from 1 to 7 has a small spiracle (fig. *t*) which in color and shape looks like the thoracic one (fig. *s*), and below each spiracle is a spine; last segment is rounded posteriorly and has a tail-like prolongation; anteriorly, there is a transverse row of four widely separated, long, pointed spines terminating like a hair; at the middle is a transverse, granular, dull area, and posteriorly it ends with a pair of broad, bifid lobes; each lobe is compressed, rounded dorsally, but ventrally sharp and spine-like; ventrally and near the base the segment bears two widely separated pairs of small spines. Leg capsules reach to the first fifth of the second segment.

Length, 8–10 mm.; width of thorax, 1.5–2 mm.

**XYLOPHAGUS LUGENS Loew**

**Plates 1 and 2**

*Habits*.—Larvae are predacious on beetle larvae and were found under the bark of chestnut, pine, and oak.

*Larva* (fig. *3*).—Very much like *Xylophagus abdominalis* with the following exceptions: The anterior portion of the head has a single bristle on each side; posterior to this bristle are two others closely set together and at the base is a single bristle; the chitinous plates on the dorsum are absent on segment 3; on the anterior edge of the chitin of the first segment is only a single bristle on each side; anterior spiracle (fig. *g*) is deep red with the anterior portion rounded and the posterior terminating in a long, narrow band; the anterior portion has a transverse, reddish yellow, crescent-shaped area divided into narrow parallel structures, which are pointed anteriorly, and in front of this area is a narrow, black, curved band; just back of the reddish yellow crescent-shaped area is a narrow, light-colored, spindle-shaped one inclosed by a darker ring. Caudal plate bifid at apex with the two prongs widely separated at the base; posterior spiracle (fig. *h*) is elliptical, slightly elevated, very dark red, and apparently open in the center; the design following the contour is arranged as a double row of short serrated lines. Ventral sides of segments 1 and 2 either entirely covered or nearly covered with chitin; anal plate almost circular and the roughened border around this plate and the V-shaped arms on each side are very wide.

Length, 15–19 mm.; diameter, 2–2.75 mm.

Great Falls, Va.: larvae under bark of chestnut feeding on larvae of *Urographis fasciata* (Degeer). Larvae collected March 28, 1917; adults emerged April 2, 1917, C. T. Greene, collector. Virginia shore, near Plummer Island; no date; H. S. Barber, collector. Dead

Run, Fairfax County, Va., March 20, 1924. Adults emerged March 24, 1924, C. T. Greene, collector.

*Pupa* (fig. 9).—Light amber yellow; semitransparent; thorax more shining than the abdomen; abdomen nearly cylindrical. The antennal capsule is annulated and more reddish yellow than the head; on the upper edge of the base of the capsule and pointing outward is a hornlike, cylindrical projection, and at the base is one large bristlelike hair; between the bases is a deep groove, and apically on the head is a small plate with four rounded punctures; head capsule smooth with the ocellar depressions well defined; immediately in front of the sinuate posterior suture, and on each side of the median line, is a transverse row of eight or nine slightly elongate depressions or punctures. Thorax nearly as wide as long; just back of the middle of the lateral margin is a large single bristle; at the anterior portion, on the dorsum, are four rounded depressions, and just back of these is a transverse, slightly arcuate row of similar depressions; on each dorsal anterior angle of the thorax is located a thoracic spiracle (fig. 9); these spiracles are slightly more reddish than thorax and have a raised black ridge; upon the latter is located the spiracular entrance, which contains a series of small radiating slits arranged in a sinuous line. The abdomen is composed of eight segments; the first segment is rather narrow; the third to eighth of nearly equal length; segments from 1 to 7 have a spiracle (fig. 7), which is very similar to the thoracic spiracle but smaller, and with the ridge more brown than black; below each abdominal spiracle is a spinelike bristle; first segment has a transverse row of four long bristles on its dorsal and more numerous bristles on its lateral portions, while the segments from 2 to 7 have a transverse row of closely set laterally longer bristles, and on these latter segments a broad, transverse, rugose band is present along the basal margin; last segment is longer but not so wide as the preceding; it bears a transverse enlargement along which are large bristly spines arranged in groups of four; and it terminates in a large prolongation which apically is split into two conical lobes, each with a blackish point; the ventral sides of the segments from 1 to 7 bear a transverse row of bristles corresponding to those on the dorsal sides; the last segment has two spinelike outward-pointing projections on the venter, near the middle. Leg capsules reach the middle of the third segment.

Length, 11–14 mm.; width of thorax, 2–3 mm.

**XYLOPHAGUS ABDOMINALIS Loew**

Plates 1 and 2

*Habits*.—Larvae are predacious on beetle larvae which were found under the bark of pine.

*Larva* (fig. 4).—Large, elongate, cylindrical, ivory white; head black, pointed and chitinized when fully extended longer than shown in figure 4; on the antero-dorsal portion are two parallel punctures; near the anterior end of each of these punctures is a pair of short bristles; farther back is another pair of bristles; just posterior to this pair and nearer the median line is a single bristle; on the side, near the base, is a single bristle. There are 11 segments in addition to the head; the first longer than the second; second segment rather short; segments 3 and 4 of equal length, a little longer than the second; segments 5 to 10 much longer than segment 4, and each succeeding segment slightly longer than the preceding; first three segments with deep reddish, mahogany-colored chitin plates on the dorsum; chitin plates on the third segment vary from two large spots, as shown, to a continuous band; anterior spiracle (fig. *i*) large, chitinized, mahogany red, broadly rounded anteriorly and tapering to a point at the posterior end; in the broad portion is a transverse elliptical blackish area with a round black dot in the middle; in front of this is a broad crescent-shaped yellowish area with a middle row of bead-like tubercles, and anterior to this area is a narrow, black, crescent-shaped band; the segments from 4 to 9 have a transverse, antero-dorsal band of red chitinous spines; first segment has three large bristles dorsally on side; segments 2 and 3 have two bristles, dorsally, on each side; segments 4 to 10 have two bristles laterally on each side; segments 1 to 10 have a single bristle on the lateral surface near the middle; the last segment has three bristles on each side, and a heavily chitinized plate is present at its apex, anterior edge of plate pointed, and posterior end of plate bifid, each prong curving outward; on the dorsum of this plate are present on each side, one large bristle in the middle; two similar ones laterally, one at the base of the prong and two near its apex; on the ventral surface is a single bristle; on the dorsum of the plate, near the base of the prongs, on each side is located the posterior spiracle (fig. *j*); this is very dark red; the middle portion is depressed and has a large dark spot at the anterior end, and around the middle depressed area is an elevated, flattened ridge divided into 62 small rectangular plates; on each side of the middle part of the dorsum of the last segment is a large irregular, chitinous plate, and along the anterior segmental line on each side are two smaller, irregular plates of red chitin which are variable in size. On the ventral surface each segment from 1 to 3 has a pair of widely separated bristles near the transverse middle line of the segment; the venter of segment 1 has red chitin along the anterior edge extending along the lateral edges until it reaches the posterior end of the segment, and on the segments from 4 to 10 is a transverse, roughened band of small chitinous points present anteriorly; anal

opening long, in the center of a large, broad, oval-shaped area which has a V-shaped arm on each side; the edge of this oval-shaped area and the arms are roughened; each segmental line is completely encircled by a row of small, chitinous, rounded dots.

Length, 25-28 mm.; diameter, 2.75-3 mm.

Riverton, N. J., larvae and pupae under damp bark of pine March 20. Male and female adults emerged April 5, C. W. Johnson, collector. Falls Church, Va., October 10, 1913, C. T. Greene, collector. Webster, N. H., reared May 4, 1906, W. F. Fisk, collector. Hopks. U. S. No. 3731*f*. Falls Church, Va., reared June 12, 1916, from under bark of *Pinus virginiana* by C. T. Greene.

*Pupa* (fig. 8).—Light amber yellow; semitransparent, with the thorax shining and the abdomen rather dull and cylindrical. The antennal capsule annulated, more reddish yellow in color; there is a deep groove between the bases of the antennal capsules; no horn-like projection at base of capsule; at the dorsal base of each antenna is one long yellowish, bristle-like hair; the plate or area back of the antennae has two raised parts on each side; three ocellar punctures present; to the outer side of these punctures, on each side, is a group of about 15 long yellow bristle-like hairs; postero-dorsal suture of the head is sinuous and marked by about a score of elongated, narrow depressions. The thorax is much longer than wide; near the anterior end of dorsum is a transversely arcuate row of punctures, which are larger toward the middle of the row, and near its posterior end is a sinuous suture with numerous elongated narrow punctures in front; the anterior or prothoracic spiracle (fig. *o*) is deep reddish yellow with several wrinkles which are much darker in color, and it is located at the outer anterior angle of the thorax; spiracular slits light yellow, radiating and arranged in a sinuous row whose ends are bent toward each other and nearly touching; on each side of the thorax, near the transverse middle line, is a large bristle-like hair; just back of this hair and above it are two similar hairs: near the posterior end of thorax is a sinuous suture having numerous, elongated, narrow punctures along its anterior edge; and near the posterior angles of the thorax, on each side, are two bristles. Abdomen cylindrical or occasionally depressed, composed of eight nearly equally long segments; segments from 1 to 7, on each side, with a shining reddish yellow spiracle (fig. *p*.) similar in color to the prothoracic; below each abdominal spiracle is a spine-like bristle; first segment with a transverse row of widely separated bristles along the posterior edge; these bristles are more numerous toward the lateral end; posterior margin of segments 2 to 7 with a row of closely set bristles which are longer laterally; each of the segments from 2 to 7, when fully extended, has a broad transverse

rugose band along the basal margin; last segment swollen laterally, with four pairs of bristles arranged in a transverse row across the middle of the dorsum; apex bilobed, each lobe rounded apically and terminating with a large bristle; ventrally, the posterior margins of segments from 1 to 7 are provided with a transverse row of bristles in continuation of the dorsal rows, and medianly on the ventral side of the last segment are two small tubercles which terminate in a laterally projecting spine.

Length, 12–15 mm.; width of thorax, 2.25–3 mm.

ATHERIX VARIEGATA Walker

Plate 1

*Habits.*—The eggs are deposited in dense masses attached to dry branches overhanging water. Numerous females contribute to the formation of these egg masses and they also remain there and die. The larvae hatching drop into the water, where they are predacious.

*Larva* (fig. 5).—Large, luteous, cylindrical, smooth; 11 segments; first four segments tapering anteriorly; the caudal segment with two long processes; prolegs well developed. Both thoracic and abdominal spiracular plates undeveloped. Head quite small, well developed, retractile; antenna small, cylindrical, pointed, about four times longer than its diameter. Segments 1 to 3 have three large bristly hairs on each side, arranged in a vertical row; segment 4 has a small, pointed tubercle on the latero-dorsal portion, and one pair of well developed prolegs (fig. k) with large, hook-like spines on their ventral surfaces; posterior to each proleg are two spine-like hairs; segments 5 to 10 similar to the fourth but larger, the tubercles are larger and there is an additional pointed process on the lower anterior part of the side; this process is much longer on the tenth segment; last segment slightly smaller than the preceding segment and has two pointed, plumose processes which are slightly longer than the segment; on the side of the segment is a horizontal row of long, delicate yellow hairs; anal opening on the dorsum between the bases of the two processes; on the dorsum, on each side, is a group of three long bristly hairs, and on the venter is a single median proleg; posterior to this and above it is a transverse, elliptical, smooth, white respiratory organ, which can be inflated. On the ventral surface of each of the abdominal segments from 1 to 7 and posterior to the prolegs, is a pair of bristle-like hairs; at the ventral base of each caudal process there is also a bristle-like hair.

Length, 18 mm.; diameter, 2.25 mm.

Beltsville, Md., in Paint Branch, July 2, 1922, H. S. Barber, collector.

## VERMILEO COMSTOCKII Wheeler

## Plates 1 and 2

*Habits*.—The eggs are deposited in sand, and the larvae form conical pitfalls in which to ensnare small insects.

*Larva*.—The dried larval skin is opaque white and is so distorted that it is impossible to give any idea of the shape. It is fastened at the tip of the pupa (fig. 11); near the caudal end of the larva, and apparently on the dorsum, are three pairs of very stout yellowish spines which taper to a hook-like point; the mouth parts (fig. 6) are deep brown, semitransparent; head capsule seen from above pyriform in outline, the anterior portion irregularly sculptured; in the lateral view it is arched dorsally; the long central rod is broad and arched; the small rods at the anterior end are parallel to the main rod.

Even after soaking this larval skin for a day or two I was unable to add anything to the above.

*Pupa* (fig. 11).—Medium sized, semitransparent, very faintly yellowish white, thorax semitransparent with a yellowish brown infuscation and slightly larger in diameter than the abdomen; abdomen tapering slightly toward the apex. Head small, rounded; antennal capsules elongated, pointed and slightly raised from the undersurface of the head. Thorax longer than broad and smooth; wing pads with numerous short rugosities; on the dorso-lateral surface of the thorax, near the anterior end, is located the thoracic spiracle (fig. *u*); this spiracle is very small, deep brownish black, shining, with the narrow outer edge and the central design paler in color; directly below the spiracle, directed forward and slightly downward, is a long, tapering, spine-like bristle. Abdomen is composed of eight segments of about equal length but tapering toward the apex; on the intersegmental skin are two transverse lines composed of very small, roughened areas which may be easily concealed in the segmental folds; near the antero-lateral angle of the segments from 1 to 7, are the abdominal spiracles (fig. *v*), which are very small, reniform, with an anterior concavity, and brownish black with four radiating, narrow, dark yellow stripes. The last segment is very narrow but otherwise can not be described on account of the larval skin being attached in such a way that it can not be removed.

Length, 8 mm.; diameter of thorax, 1.75 mm.; diameter of abdomen at base, 1.25 mm.

Larval skin attached to apex of puparium. Alta Meadows, Calif., no date, Dr. W. M. Wheeler, collector.

## CHRYSOPIA, species

## Plate 1

*Habits*.—Larvae appear to be scavengers. They are found under dead leaves on the ground in the woods and also in the wet frass in tree holes.

*Larva* (fig. 7).—Large, white, cylindrical, elongate, smooth; first two segments tapering slightly to the small head; 11 segments in addition to the head. Head (fig. 1) small, its dorsal portion with faintly impressed lines, giving the surface a slightly rugose appearance; the frontal portion of the head (*fph*) is heavily chitinized, the chitin is reddish yellow, and is divided into a right and left half, each half terminating in an arcuate row of large, elongated teeth; seen from above, the head is divided antero-medially by an elongate, keel-shaped plate (*pZ*) which is compressed below; on each side of this plate is an elongated, triangular area, covered with reddish yellow spines pointing upward and slightly backward; laterally, is a small oval elevation upon which is located the antenna; this is white, cylindrical, single jointed, slightly larger at the base and with its length about five times its diameter; mandibles (*md*) triangular, robust, heavily chitinized, reddish-yellow; maxillary palpus white, smooth, cylindrical, its length about four times its diameter. On each side of the ventral surface of the head are two small bristles. First 10 segments are of equal length; the integument along each segmental line is raised into 5 to 7 transverse rows of slightly flattened ridges and each ridge is divided into short scale-like parts of unequal length. Anterior spiracle (fig. *m*) small, slightly elevated, yellow, located on the side of the first segment, oval in outline; the center with a small, circular white spot, and two small oval depressions posterior to this spot; last segment slightly rounded, terminating in four pointed, flattened lobes, the under surface of which is yellowish and slightly rugose; these lobes have a short yellow fringe of hairs around the edge, and each lobe has a large bristle in the middle of its inner face just before the apex; between the upper and lower lobes is a large conical tubercle pointing backward; on the side of last segment are several well defined, linear depressions; anal opening in the middle of the venter of last segment, located on a large, rounded, rugose elevation. Posterior spiracle (fig. *n*) is situated at the base of each upper lobe; it is heavily chitinized, reddish yellow, and in outline elliptical with a slight dorsal concavity; the peritreme is divided into 40 equal parts which are pointed distally, and proximally at their bases is a row of short, radiating, raised lines; in the center of the spiracle is a transverse, sinuous depression.



Length, 26 mm.; diameter, 3 mm.

Near Plummer Island, Md., March 20, 1921, H. S. Barber, collector.

COENOMYIA FERRUGINEA Scopoli

Plate 2

*Habits*.—Larvae appear to be predacious. They have been recorded as occurring in fields and probably feed on white grubs which are common there.

There are no specimens of the larva of this species in the national collection.

*Pupa* (fig. 12).—Robust, dark yellowish red, the thorax shining, smooth, and the abdomen more yellowish subpolitus, rugose and cylindrical. Head broad, very rugose; antennal capsule deep red, short, robust, annulated on apical portion; in front of the base of each antennal capsule is a short conical process pointing outward; seen from above there is a small, well defined groove medianly in the anterior part of the head, and a long bristle on each side of this groove; below each antenna is a flattened, pointed process pointing outward, and at its base is a stout bristle; in the middle of the dorsal part of the head is a small rugose area with a large bristle on each side, and in the middle of the ventral part of the head is a broad, flattened process extending forward; behind this process is a raised, rugose area; width across head about four times the height. Thorax usually as broad as long, sometimes a little longer than broad; the suture at the anterior edge is very sinuous with a deep notch in the middle; near this notch are two short and one long transverse rugosities; at about the anterior fourth of the dorsum is a transverse sinuous row of small rounded punctures, and on the posterior half of the thorax there are several short, transverse lines of faint punctures; thoracic spiracle (fig. *w*) is located dorso-laterally on a prominent elevation; the peritreme is shining deep red while the inner part is luteous and nearly dull; in the skin belonging to the elevation and posterior to the spiracle is a depression with a narrow black line in the middle, and this line is bifurcated at the anterior end; near each posterior angle of the thorax is a rounded, well defined depression. Abdomen has eight well defined segments of nearly equal length; first segment without a transverse row of spines at its posterior margin; segments from 2 to 7 with a row of reddish spines posteriorly; segments from 1 to 7 have one central and two dorso-lateral pairs of long yellowish bristles; segments 1, 2, 6, and 7 each with a single transverse curved row of small, rounded punctures; segments 3 to 5 each has a double row of such punctures; on a prominent elevation on the side of each segment from 1 to 7 is a heavily chitinated spiracle

(fig. *x*); these spiracles are similar to the thoracic spiracles (fig. *w*) but are slightly smaller; last segment terminates in two very robust, conical tubercles; near their dorsal base is a median unpaired, deep, rounded puncture; on the dorsum of the segment is a pair of oblique, elliptical depression, the edges of which are faintly annulated on the outer side but quite broad and nearly smooth on the inner side; each side of the segment forms a large, rounded lobe beset with an arcuate row of seven very large, spine-like projections pointing backward; at the basal margin of the segment and near its longitudinal middle line are four spines in a row, the two in the middle very long and the two exterior small. On the venter along the posterior margins of the segments are rows of spines as on the dorsum, but the ventral spines are longer than the dorsal.

Length, 30 mm.; diameter of thorax, 7 mm.; diameter of abdomen, 6 mm.

Fairbury, Ill., no date, A. H. Mundt, collector. Also a small label bearing "22." Another specimen labeled "3893. Issued April 20, '86."

#### LEPTIS MYSTACEA Macquart

##### Plate 3

*Habits*.—Larvae are predacious and have been recorded as occurring under moist dead leaves on the ground in the woods.

There are no specimens of the larvae of this species in the national collection.

*Pupa* (fig. 13).—Medium sized, luteous, subpolitus; thorax slightly wider than abdomen. Head rounded, slightly wider than high; antennal capsules widely separated, appearing like a long pointed ridge on the front of the head (fig. *y*); just above and between the bases of the antennae are two round, rugose tubercles; above this pair of tubercles are three faint ocellar punctures; dorsally, at the base of the head, are six radiating faint wrinkles. Thorax slightly longer than wide; on the anterior suture of thorax and close to the median line are two crescent-shaped areas the edges of which are darkened; at each of the anterior thoracic angles is a dark brown, rugose elevation upon which is situated the thoracic spiracle (fig. *z*); its large entrance is yellow and contains numerous small, parallel, elliptical slits; wing pads smooth, reaching to the base of the first segment; leg capsules reaching a little beyond the wing pads. Abdomen is composed of eight segments of equal length; the first segment is smooth and destitute of spines; each of the segments from 2 to 7 has a posterior, transverse row of sharp-pointed spines of unequal length, and also on the dorso-anterior surface a transverse row of four sharp-pointed spines, of which

the inner ones are much larger and the outer ones sometimes entirely wanting; on the side of each segment is a broad elevated surface of the length of the segment; on this elevation are two large pointed spines, and sometimes several very small ones, forming a row, and at the anterior portion of the elevation is a small, reddish, elliptical tubercle upon which is located the abdominal spiracle (fig. *aa*); the spiracular entrance and general color as in the thoracic spiracle (fig. *s*); last segment is much narrower than the rest, with a pair of large, black, shining, pointed, conical projections widely separated and black at the tip only; dorsally, between these two pairs of conical projections, is a rounded, well-defined depression.

Length, 12 mm.; diameter of thorax, 2.9 mm; diameter of abdomen, 2.5 mm.

Falls Church, Va., April 19, 1919, in frass at the base of an old decayed tree stump. Reared April 25, 1919, C. T. Greene, collector. Great Falls, Va., April 12, 1924, in a rotten log of sycamore. Reared April 22, 1924, C. T. Greene, collector.

CHRYSOPILA QUADRATA Say

Plate 3

*Pupa* (fig. 14).—Medium sized, subpolitus, yellowish red; thorax very slightly wider than the abdomen. Head nearly round; antennal capsules very small, pointed at apex, lying quite close to the under side of the head, appearing like small ridges; above the antennae, on the front of the head, are two small, rounded tubercles, and just back of this pair are four small, similar ones in a transverse row; on top of the head are two small bristles widely separated. Thorax about as broad as long; at the anterior median part, along the suture, are two small, pear-shaped rugose areas, each having two small bristles; laterally of these areas, on the anterior angle, is a prominent rugose tubercle upon which is situated the thoracic spiracle (fig. *bb*); this spiracle is very small, shining, reddish yellow with a sinuous entrance composed of small radiating, paired slits; on dorsum, near the middle, are two pairs of short bristles, the bristles of the posterior pair closer together; a narrow transverse plate is present at the posterior end of thorax; it is rugose in the middle and at each end of this rugosity are two short bristles; at each anterior angle is a single bristle. Abdomen is composed of eight segments of nearly equal length; each of the segments from 1 to 7 has a narrow transverse ridge near the basal edge; segment 1 has three bristles on each side of the dorsum; segments from 2 to 7 have a transverse, apical row of short, stout spines with a few longer than the majority; segments 1 to 7 have on the side near the basal angle a small rounded tubercle upon which is located a very small

spiracle (fig. *cc*), color and general details as in the thoracic spiracle (fig. *bb*); last segment has four large pointed processes along the posterior edge with much shorter ones between; the end of the segment is depressed in the middle with four small, rounded tubercles on the edge; ventro-posteriorly the segment is divided into two sharp, pointed, conical appendages.

Length, 10 mm.; diameter of thorax, 2 mm.; diameter of abdomen, 1.75 mm.

Dead Run, Va. In frass at the base of a tree. Reared May 11, 116, by C. T. Greene, collector.

CHRYSOPIA FASCIATA Say

Plate 3

*Pupa* (fig. 15).—Small, dull, yellowish red with the thorax sub-politus. Head broader than high; antennal capsules small, narrow, slightly raised on the lower front part of the head; between these capsules are two narrow punctures; below each antenna is a small bristle; above the antennae are two small tubercles close together; just above these are four rounded tubercles in a transverse row, each outer tubercle has a bristle at the apex; above these is another row of four tubercles, the two middle ones much smaller than the two outer ones and each tubercle having a bristle at the apex; on the dorsum near the back of the head is a pair of rounded tubercles widely separated, and just in front of the suture at the back of the head, near the thoracic spiracle, is a small, rounded tubercle; between these tubercles are several radiating rugosities near the middle. Thorax nearly one and one-half times longer than wide; on the middle of the dorsum are four small, rounded tubercles each with a bristle at the apex; on the anterior suture and narrowly separated are two broad, slightly raised, rugose elevations, each having a small bristle at the apex; at each anterior angle is a well defined, elongate tubercle, upon which is located the thoracic spiracle (fig. *dd*); this tubercle is reddish yellow, darker at the base; the slit is long, sinuous, yellow, and composed of small, parallel slits; on the side of the thorax, near the middle transverse line and close to the margin, is a single bristle; the narrow plate at the base of the thorax has two bristles on each side widely separated from the corresponding bristles on the opposite side. Abdomen is composed of eight segments, the first seven are nearly equal in length; first segment has a pair of widely separated bristles in the middle of the posterior portion of the dorsum; on each side of this pair are two rather closely set bristles; segments from 2 to 7 have at the posterior third a transverse dorsal row of sharp spines which terminate in a

short bristle, and near their basal margin have a transverse narrow ridge; each of the segments from 1 to 7 has a small tubercle at about the basal third of the lateral margin on which is located an abdominal spiracle (fig. *ee*); these spiracles are very similar to the thoracic (fig. *dd*) but smaller; last segment about half as long as broad; on the dorsum on each side of the longitudinal middle line are three spines close together, the middle one much the longer; and exterior to these is one large spine with a small one at its base; viewed from behind, in the middle of the segment, is a depression with two rounded tubercles on the upper edge, and on the ventral part of the segment are two conical projections terminating in a sharp point; on the ventral side of the segments from 1 to 7 are rows of spines like those on the dorsum.

Length, 7 mm.; diameter of thorax, 1.85 mm.; diameter of abdomen, 1.25 mm.

Baton Rouge, La., January 1, 1923. Reared April 2, 1923, T. H. Jones and W. G. Bradley, collectors; also labeled "La. Agr. Exp. Sta. No. 1014."

#### CHRYSOPIA FOEDA Loew

##### Plate 3

*Pupa* (fig. 16).—Fairly large, brick red; thorax shining, slightly wider than the abdomen; abdomen cylindrical. Head rounded, slightly depressed in front; antennal capsules small; tapering to a point, closely attached to the head below; on dorsum of head, widely separated, are two small tubercles, each with a bristle on top at the apex. Thorax about as wide as long; along the medianly dorso-anterior suture are two pyriform raised surfaces, each with a small bristle-bearing tubercle; near the anterior angle is a large rugose tubercle, upon which is located the thoracic spiracle (fig. *ff*); the large sinuous entrance place contains a series of small, mostly parallel yellowish slits; in the middle of the dorsum is a pair of short yellow bristles; the small plate at the dorso-basal part of the thorax has a bristle at each anterior angle. Abdomen has eight faintly rugose segments of nearly equal size; first segment, on the posterior half of the dorsum, has six bristles in a transverse row; segments from 2 to 7 have a transverse posterior row of short, closely set spines; segments from 1 to 7 have a tubercle on the sides at about the anterior third and upon the tubercle is located a spiracle (fig. *gg*); these spiracles are like figure *ff*, but smaller and not quite so rugose; last segment has a median transverse row of large, pointed, spine-like projections on each side; from the middle outward they are arranged as 3, 1, and 1; viewed from the rear the posterior end of the caudal segment is concave medianly with four rounded

tubercles at the edge; below this concavity are two oblique grooves; the ventral part of the segment terminates in a very large bifid tubercle with each prong pointed at the end; on the ventral side of segments from 1 to 7 are transverse rows of spines similar to the dorsal rows and continuous with these.

Length, 15 mm.; diameter of thorax, 3 mm.; diameter of abdomen, 2.70 mm.

Northern Illinois, no date. Collection of D. W. Coquillett.

CHRYSOPIA ORNATA Say

Plate 3

*Pupa (fig. 17).*—Large, dull, cylindrical, brick red, slightly darker toward caudal end; thorax slightly wider than abdomen. Head much broader than high; on the front part of the head are two pairs of rugose bristle-bearing tubercles, the anterior pair smaller and closer together; below these tubercles, very widely separated, are the antennal capsules, which are rounded, elongate, tapering to a point and fitting close to the head; on the postero-dorsal portion of the head are two widely separated rugose tubercles without bristles. Thorax about as wide as long; along the dorso-anterior suture are two elliptical areas, each area with a median rugose tubercle which terminates in a thin hair; each antero-lateral angle with a prominent rugose tubercle which bears the thoracic spiracle (fig. *hh*); the spiracular entrance place is sinuous and composed of numerous, mostly parallel, yellow slits; at the postero-dorsal end of the thorax is a plate which is rugose medianly, each antero-lateral angle has a small bristle-bearing tubercle, and near the anterior edge a transverse row of four bristles; wing pads smooth, reaching to posterior edge of first abdominal segment; leg capsules between and extending slightly beyond the wing pads. Abdomen with eight faintly rugose segments; first segment with a posterior transverse row of three pairs of bristles; segments 2 to 7 with a transverse, posterior row of short spines and three pairs of longer spines in the same row; on the side of each abdominal segment is a prominent faintly rugose tubercle upon which is located a spiracle (fig. *ii*), details as in figure *hh*, but it is smaller; the last segment has six conical, dorsal lobes each terminating in a thickened, elongated, conical process with a sharp point, the outer one of the lobes generally a little larger than the others; the postero-ventral part of last segment terminates in a broad bifid lobe with each of the branches pointed at the end; seen from the rear, the last segment has a deep depression, on the upper and lower edge of which is a pair of prominent tubercles, the upper pair being the larger; below this depression are two well-defined, oblique grooves, pointing downward and outward.

Length, 16 mm.; diameter of thorax, 3.75 mm.; diameter of abdomen, 3 mm.

Specimen bearing two labels: "Johnson, Pa., April 27, 1900. Issued May 31, 1900," and "9199. In soil."

### EXPLANATION OF PLATES

(Reproduced from drawings by the author)

#### PLATE 1

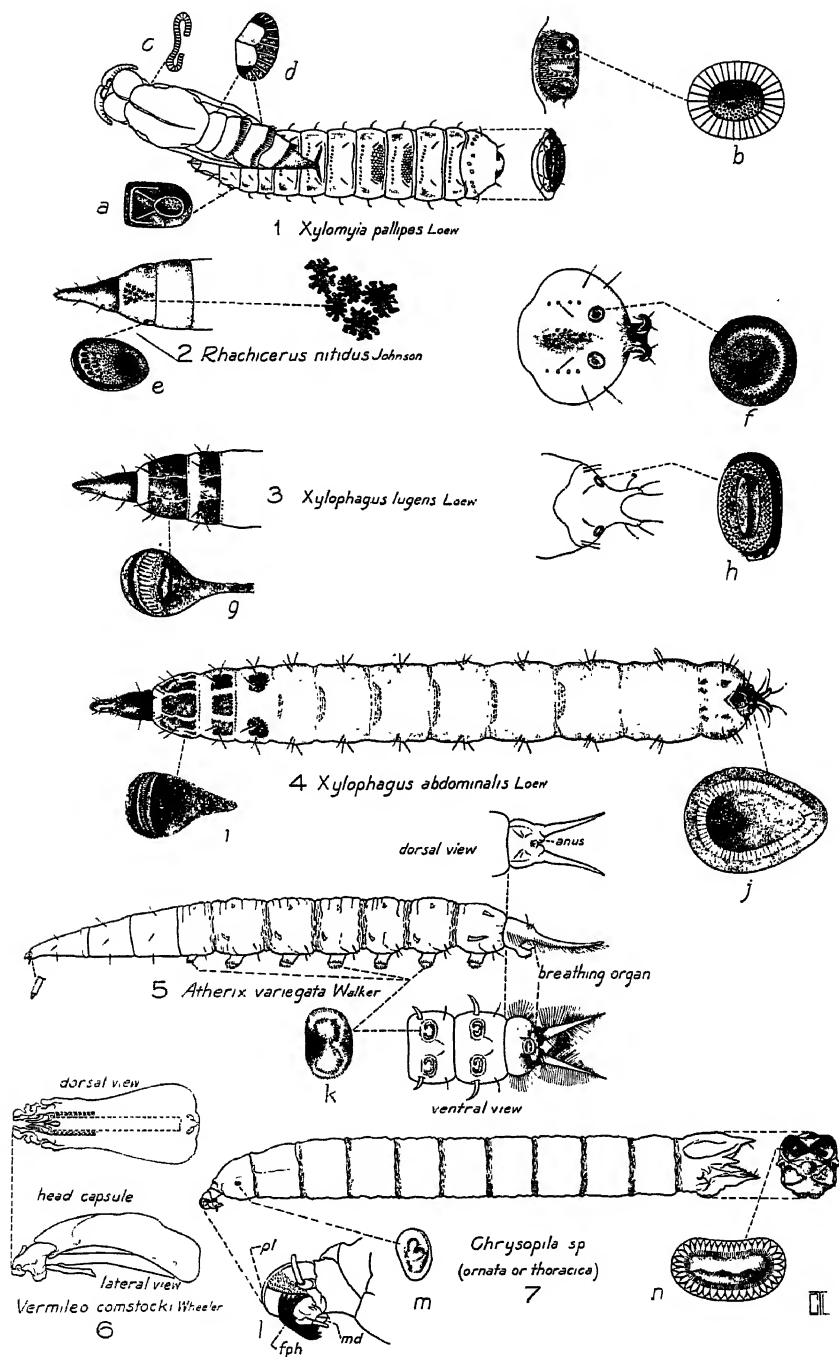
- FIG. 1.—*Xylomyia pallipes* Loew, larva: (a) anterior spiracle; (b) posterior spiracle. Pupa: (c) anterior thoracic spiracle; (d) abdominal spiracle.
- 2.—*Rhachicerus nitidus* Johnson, larva: (e) anterior spiracle; (f) posterior spiracle.
- 3.—*Xylophagus lugens* Loew, larva: (g) anterior spiracle; (h) posterior spiracle.
- 4.—*Xylophagus abdominalis* Loew, larva: (i) anterior spiracle; (j) posterior spiracle.
- 5.—*Atherix variegata* Walker, larva: (k) ventral view of proleg.
- 6.—*Vermileo comstockii* Wheeler, larval head capsule.
- 7.—*Chrysopila*, species, larva: (fph) frontal portion of head (left half shown); (l) head enlarged; (m) anterior spiracle; (md) mandible; (n) posterior spiracle; (pl) keel-shaped plate.

#### PLATE 2

- FIG. 8.—*Xylophagus abdominalis* Loew, pupa: (o) anterior thoracic spiracle; (p) abdominal spiracle.
- 9.—*Xylophagus lugens* Loew, pupa: (q) anterior thoracic spiracle; (r) abdominal spiracle.
- 10.—*Rhachicerus nitidus* Johnson, pupa: (s) anterior thoracic spiracle; (t) abdominal spiracle.
- 11.—*Vermileo comstockii* Wheeler, pupa: (u) anterior thoracic spiracle; (v) abdominal spiracle.
- 12.—*Cocconomyia ferruginea* Scopoli, pupa: (w) anterior thoracic spiracle; (x) abdominal spiracle.

#### PLATE 3

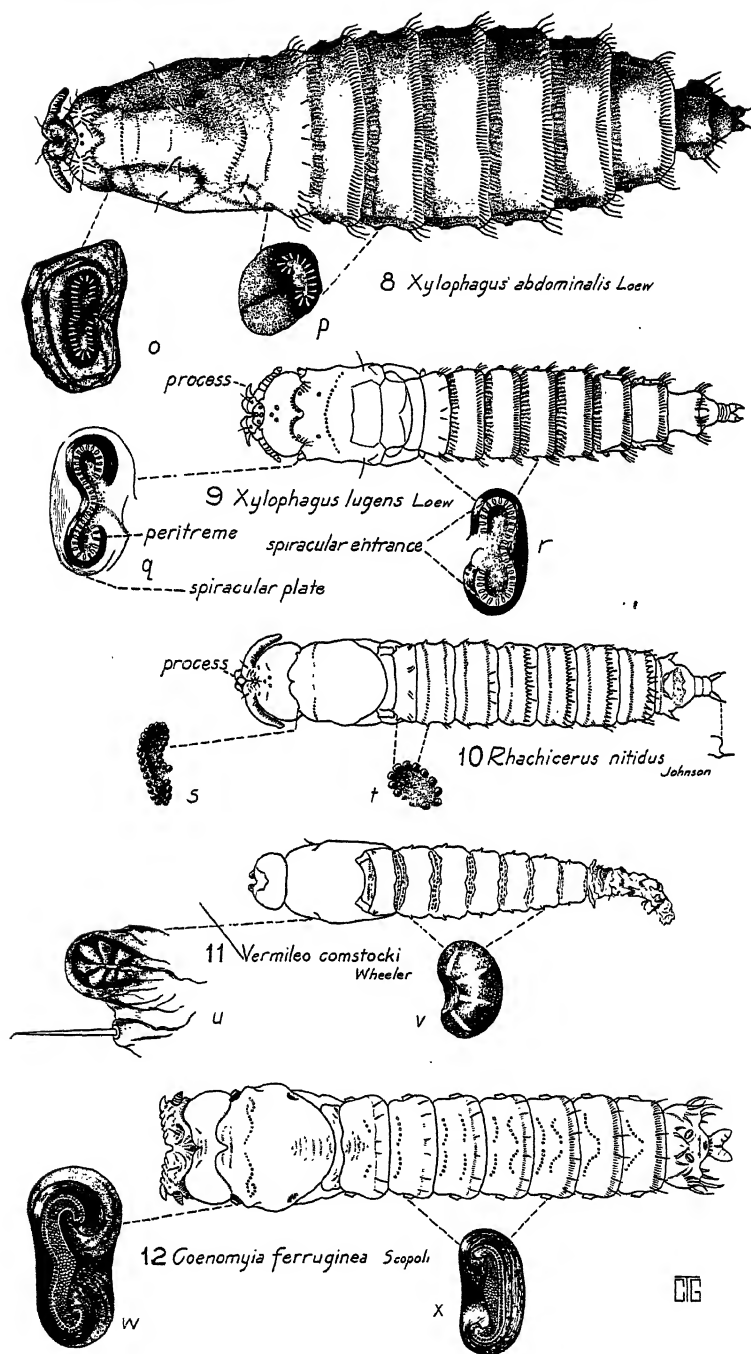
- FIG. 13.—*Leptis mystacea* Macquart, pupa: (y) ventral view of head; (z) anterior thoracic spiracle; (aa) abdominal spiracle.
- 14.—*Chrysopila quadrata* Say, (bb) anterior thoracic spiracle; (cc) abdominal spiracle.
- 15.—*Chrysopila fasciata* Say, (dd) anterior thoracic spiracle; (ee) abdominal spiracle.
- 16.—*Chrysopila foeda* Loew, (ff) anterior thoracic spiracle; (gg) abdominal spiracle.
- 17.—*Chrysopila ornata* Say, (hh) anterior thoracic spiracle; (ii) abdominal spiracle.



## LARVAE AND PUPAE OF THE FAMILY LEPTIDAE

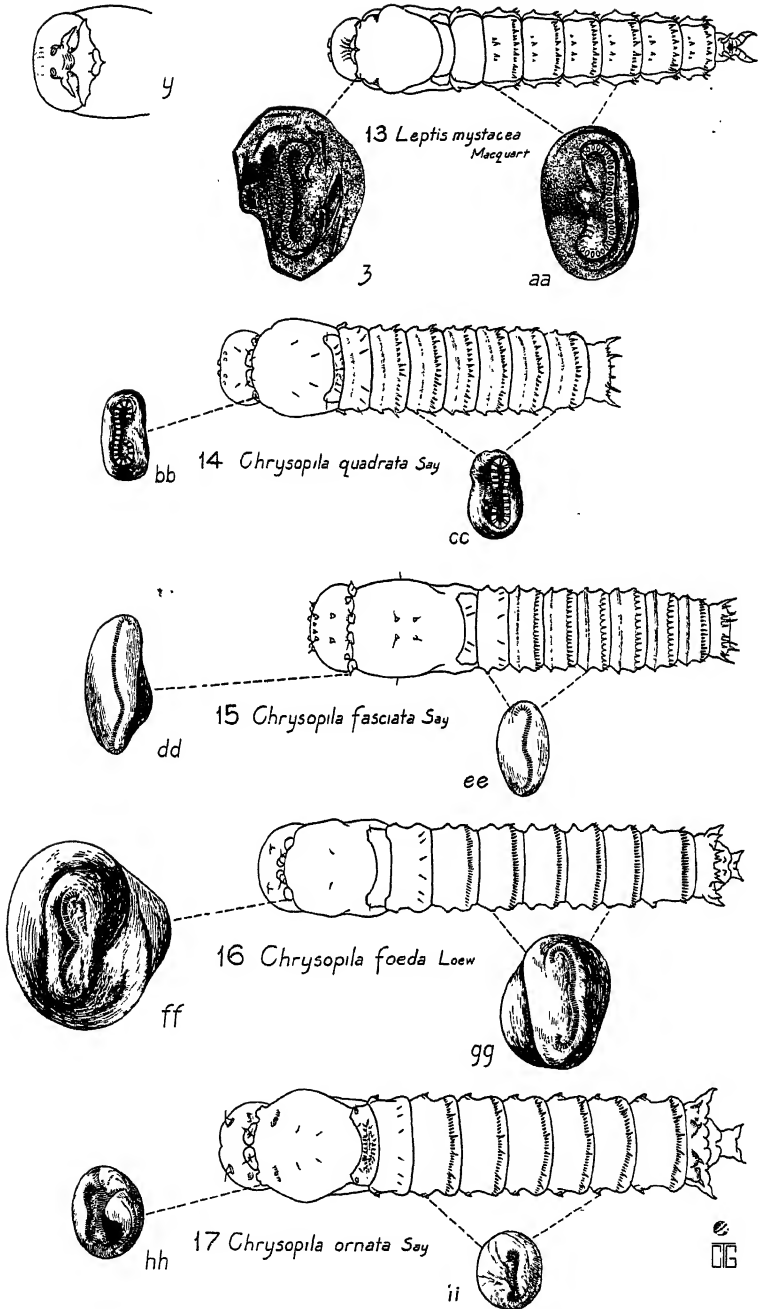
FOR EXPLANATION OF PLATE SEE PAGE 20





## PUPAE OF THE FAMILY LEPTIDAE

FOR EXPLANATION OF PLATE SEE PAGE 20



PUPAE OF THE FAMILY LEPTIDAE

FOR EXPLANATION OF PLATE SEE PAGE 20



# A FOSSIL PALM FRUIT FROM THE MIDDLE EOCENE OF NORTHWESTERN PERU

By EDWARD W. BERRY

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Calcified nuts of a palm are not uncommon at Negritos in northwestern Peru in the lower part of the Lobitos formation as delimited by Bosworth.<sup>1</sup> The horizon, according to the collector, Dr. A. A. Olsson, is middle Eocene and about the same as the upper Claiborne of southeastern North America, that is to say, Auversian according to the European scale.

These nuts are somewhat larger than walnuts, mostly decorticated, and their interiors show no structural details. They appear to me to be referable to the genus *Astrocaryum*, and are named in recognition of the collector, who has done such excellent work in northwestern Peru. The types are deposited in the United States National Museum.

## ASTROCARYUM OLSSONI, new species

Fruits as preserved varying in form from subspheroidal to prolate, more or less pointed distad and flattened proximad so that they are ovate in profile. They are usually widest at or below the middle, and full and rounded, or even truncate at the base. The upper half is always more or less narrowed and may be somewhat produced and pointed. Their dimensions range from 3.75 to 5.25 cm. in length, and from 2.5 to 3.75 in maximum diameter. Despite the considerable variation in form and size they are believed to represent but a single species, since all of a dozen specimens are identical in surface markings.

The outer fibrous coat, which is preserved in patches on most of the specimens, is nowhere over 2 mm. in thickness, although in no case is it certain that its original thickness has been calcified and preserved. It consists of stout longitudinal fibers. These can be seen over part of figure 2. The inner layer, which comprises the greater

<sup>1</sup> Bosworth, T. O., *Geology of the Tertiary and Quaternary Periods in the Northwest Part of Peru*. London, 1922.

part of the surface in most of the specimens, is seen, in broken specimens, to be calcified for a thickness of between 2 and 3 mm., and to be rather prominently and transversely reticulate rugose. The interior is filled with a structureless calcareous matrix and suggests that the nuts were single seeded.

The equatorial outline of these fruits is approximately circular, and they appear to have been practically symmetrical around the polar axis, although some specimens appear to indicate a slight distal curvature. The proximal end is usually broken or incrustated with matrix, but in one specimen (fig. 4) is seen to be perforated by a large excentrically located hole. None of the specimens are sufficient to show the presence or absence of the two other perforations so frequent in this tribe.

*Cotypes*.—Cat. No. 37194, U.S.N.M.

The relatively enormous thickness of the Tertiary in northwestern Peru west of the present Andes has led Bosworth<sup>2</sup> to predicate not only the existence of the mountains in Eocene times as the source of the large amount of relatively coarse material that make up so much of these sediments, but also his belief that the climate at that time approached that of the present in this region in its aridity, a necessary correlary.

These abundant palm nuts offer some, though it must be confessed rather inconclusive evidence on this point. It is recognized that they might have been carried for considerable distances by either rivers or ocean currents. *Astrocaryum* fruits are not uncommon in the present sea drift on the Pacific coasts of Panama and Colombia, and if the currents were running in the right direction in the Eocene, as they do at the present time, these nuts could have been transported for considerable distances along the middle Eocene coast, and need not have grown in the immediate vicinity of where they are now found.

Possibly bearing upon this point are the results of certain unpublished studies by Dr. W. P. Woodring, which seem to indicate that the Tertiary Caribbean fauna did not cross the Isthmus of Panama or Central America to any appreciable extent when seaways were developed between the Atlantic and Pacific oceans because of the Pacific equatorial countercurrent and the greater tides of the Pacific in this region; and that the more tropical elements in the so-called Caribbean Tertiary faunas were of Pacific origin and indigenous on the west coast of tropical America.

The warm shore current that at the present time is an offset from the Pacific equatorial countercurrent, and which skirts the Colombian and Ecuadorian coasts, is known locally as El Niño. Its

<sup>2</sup>Bosworth, T. O., *Geology of the Tertiary and Quaternary Periods in the Northwest Part of Peru*. London, 1922.

more or less periodic increase in strength from unknown causes, as in February, 1925 when it brought floods to the semidesert coastal region of northwestern Peru, could doubtless carry such palm fruits as the present fossils southward, at least as far as Negritos, Peru, the locality where the fossils were collected. My son, E. Willard Berry, reports Entada and other drift fruits from the wet tropics to the north, as having reached Negritos this February (1926) during a somewhat less severe repetition of the climatic upset of 1925.

Another alternative that may be mentioned is that the palms which furnished these fossil fruits grew inland and east of an Eocene mountain axis which was high enough to bring about conditions like those of the present time in this region, and that these fruits were transported to their final resting place by rivers which crossed this divide, which is negatived by the abundance of these fossil fruits. Granting the altogether unlikely presence of such a river, it would hardly be expected to deposit numerous individuals of a single species at one spot, unless perhaps their floating powers and the action of the waves or some combination of eddies or currents in the estuary or at the place of debouchure of such a river might be regarded as a selective agency. It seems to me that such a combination of events is so remote as to rule out this supposition altogether.

The third alternative is that these fossil fruits were from trees growing in the vicinity where they were fossilized. Personally I can not see the evidence for a great mountain axis in Eocene times making a semidesert of coastal Peru, and I believe, that, irrespective of the exact character of the Atlantic-Pacific divide in the earlier Tertiary, it was not sufficiently elevated to prevent the Pacific coast from receiving a greater rainfall than it receives at the present time, as is proven to have been the case during the lower Miocene.<sup>3</sup>

If the present species of *Astrocaryum* could be proven to have grown in the neighborhood of where its fruits were found fossil it would prove the humidity of the middle Eocene climate of coastal Peru. As it is the only described terrestrial plant known from this horizon in this region, it can not be considered to have any decisive weight. I am inclined to interpret its ecological message as indicating such a humid environment. This inclination is not due to my belief in the late Tertiary elevation of the Andes, but rests on the presence of a considerable flora in the Oligocene of that region. This Oligocene flora is made up of the silicified fruits and seeds of nearly a score of species, many of which could not withstand water transportation and hence must have grown near where they occur as fossils. These Oligocene plants indicate a climate with a rainfall

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<sup>3</sup> Berry, Edward W., Proc. U. S. Nat. Mus., vol. 55, pp. 279-294, 1919.

and consequently a vegetation normal to the latitude, and not such as has existed since the Andes were elevated. This Oligocene flora has not yet been described in print because of the great difficulty in making precise identifications of some of its members.

It seems scarcely possible that there should have been high mountains and a desert in their rain shadow during the middle Eocene when the border lands of Colombia, Ecuador, and Panama were submerged by the first transgression of the Tertiary sea, at a time when seaways were formed between the two oceans, and the sediments of which contain a common fauna. This is especially difficult to envisage because in the continuous series of deposits in north-western Peru we find the Eocene passing into the Oligocene without any apparent structural break or faunal hiatus, and the indicated climate of the latter is moist and precludes high mountains.

I am indebted to O. F. Cook, our well known authority on living palms, for having examined these fossil fruits, and he is inclined to think that both the genera *Attalea* and *Astrocaryum* are represented. This may well be the case, but I can not see any generic differences among the 12 specimens which I have studied, and which I have accordingly referred to the second of these genera, to which the relationship seems the more conclusive.

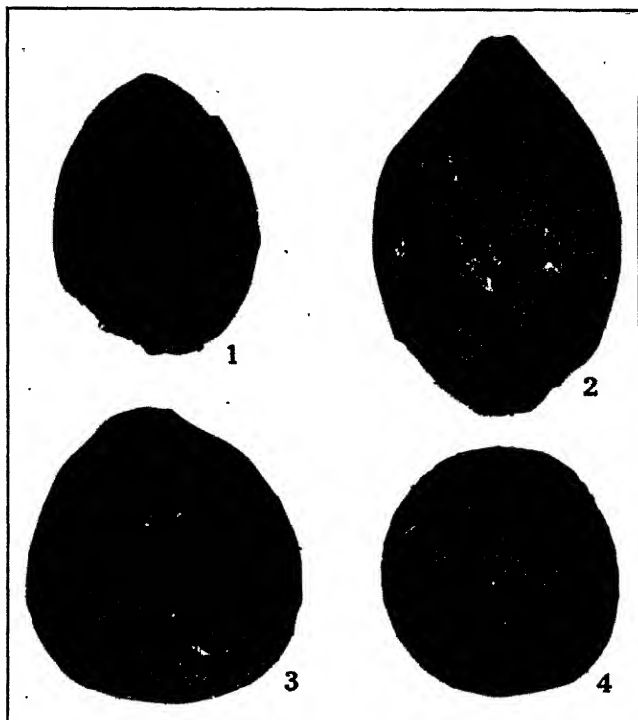
Both genera include stemless to tall feather palms, with numerous species confined to America. *Astrocaryum* Meyer has about 30 existing species, ranging from southern Mexico to eastern Peru, and reaching their maximum in the rain forests of the Amazon basin, but also found in the Brazilian Campos. Although not a coastal type, rivers contribute its fruits to ocean currents and its empty fruits are recorded in the beach drift of both coasts of tropical America and the Azores by Guppy. The genus *Attalea* Humboldt, Bonpland, and Kunth contains about 25 existing species, ranging from Honduras to Colombia and southern Brazil, and along the eastern Andes to the Yungas of Boliva. Its fruits have not been recorded in the beach drift so far as I have been able to ascertain.

#### EXPLANATION OF PLATE

FIGS. 1-4.—*Astrocaryum olssoni* Berry. From Eocene of Negritos, Peru.

- 1, 2. Side view of a large and small nut, figure 2 shows the outer longitudinal fibers in the middle region.
3. Side view of a more spherical nut showing the inner, transversely rugose surface.
4. Proximal view of a nut showing perforation.





ASTROCARYUM OLSSONI BERRY

FOR EXPLANATION OF PLATE SEE PAGE 4





# NEW UROCOPTID LAND SHELLS FROM MEXICO

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During his recent botanical explorations in Mexico, Mr. C. R. Orcutt was good enough to collect a large series of mollusks, which has resulted in quite a number of sendings from various stations visited by him. Among the material which has thus accumulated in the National Museum are a lot of Urocoptid mollusks in need of names which are here supplied. It should be remembered that No. 2594 of the Proceedings of the United States National Museum (volume 67, article 22, pages 1 to 5, with one plate), published in 1925, was based on one of the early sendings of this expedition. In this, *Holospira* (*Holospira*) *orcutti*, *Holospira* (*Holospira*) *monclovana*, and *Holospira* (*Eudistemma*) *picta* were described as new.

HOLOSPIRA (COELOSTEMMA) BALSASENSIS, new species

Plate 1, fig. 16

Animal pale brownish ashy. Shell cylindro-conic, thin, horn colored, semitranslucent. Nuclear whorls 3, strongly rounded, forming an almost cylindric apex, flattened at the top. The nuclear whorls are marked on the early turns by a finely granular sculpture only, while toward the end, the rib sculpture of the postnuclear turns, slowly and feebly encroaches upon them. Postnuclear whorls well rounded, marked by numerous rather strong, somewhat distantly spaced axial ribs which are particularly conspicuous on the slowly increasing cone of the shell, while on the middle turns they become somewhat enfeebled, again increasing in strength on the last two whorls. Suture conspicuously constricted. Periphery of the last whorl well rounded. Base short with a very narrow slitlike umbilicus. The last portion of the last whorl is solute, and on this the axial ribs become much reduced and irregular, closely spaced, and extend all around the whorl. Aperture moderately large, subcircular, the parietal wall portion flattened; peristome slightly expanded and slightly reflected. When the shell is ground down, the pillar is seen

to increase in size toward the apex and becomes very much contracted in the last turn. There is a slight twist a little nearer the base of the whorls than the middle. The pillar also is marked axially by slender retractively slanting threadlike riblets. There are no lamellae.

The type (Cat. No. 363129, U.S.N.M.) was collected by C. R. Orcutt at Balsas Station, Guerrero, Mexico. It has 19.5 whorls, and measures—length, 21.9 mm.; diameter, 5.5 mm.

The type, plus 99 topotypes (Cat. No. 363130 U.S.N.M.), yield the following measurements:

	Number of whorls	Length	Diameter
Greatest.....	20.1	22.3	6.0
Least.....	14.8	15.6	4.9
Average.....	17.3	19.2	5.5

HOLOSPIRA (COELOSTEMMA) ADRIA, new species

Plate 1, fig. 1

Shell small, pupoid. Nuclear whorls 2.3, strongly rounded, the first  $1\frac{1}{2}$  forming a cylindroid apex with a truncated top, the last one increasing materially in size. The nuclear whorls are finely granulose; the last half of the last turn shows an encroachment of the axial rib sculpture of the postnuclear turns upon it, but this is much enfeebled. The first two postnuclear whorls increasing rapidly in size, form with the nuclear turns a broad conic apex; the major portion of the postnuclear whorls form an almost cylindric spire, the greatest diameter being reached on the fifth whorl after which the diameter of the spire becomes slowly contracted. The early postnuclear whorls are marked by coarse, strong, retractively slanting axial riblets, while on the middle whorls these riblets become about doubled in number and much finer and less strongly developed. On the last turn they again become more distantly spaced and heavier. Suture strongly impressed. Periphery of the last whorl obscurely angulated. Base short, well rounded, narrowly perforated. The last portion of the last whorl is solute. On this the axial ribs become much enfeebled, closer spaced, irregular and irregularly crowded. They extend all around this portion. Aperture sub-circular; parietal wall flattened; peristome slightly expanded and reflected. In the ground-down specimen the hollow pillar is shown to increase steadily in size from the anterior to the posterior end of the shell, becoming very much expanded in the apical whorls. In the last whorl it is slender. The pillar is marked by numerous lines of growth and rather feebly developed axial threads. There are no spiral lamellae.

The type (Cat. No. 363131 U.S.N.M.) was collected by C. R. Orcutt in river drift near Rio Balsas Station, Guerrero, Mexico. It has 14 whorls, and measures—length, 10.9 mm.; diameter, 4.6 mm. A paratype (Cat. No. 363132 U.S.N.M.) has 16.7 whorls, and measures—length, 14 mm.; diameter, 4.5 mm.

**HOLOSPIRA (COELOSTEMMA) ADANA, new species**

Plate 1, fig. 14

Shell cylindro-conic, horn colored. Nuclear whorls 2.6, well rounded, all but the last half marked by fine granules only. On the latter there are slender retractively slanting axial riblets. Early postnuclear whorls forming a narrow cone, well rounded, the middle ones moderately rounded, marked by numerous retractively slanting axial riblets which are a little more distantly spaced and a trifle stronger on the cone than on the middle, but only a very little so. On the last whorl they become very strong and distantly spaced. Suture moderately constricted. Periphery well rounded. Base short, rimate, strongly rounded, marked by the continuations of the axial ribs which extend into the umbilical chink. Last whorl solute with an obsolete angle at the posterior angle of the aperture and an even less conspicuous one at the junction of the inner and parietal wall, marked behind the peristome by closely spaced axial riblets which extend all around the turn. Peristome expanded and somewhat reflected. The internal pillar rather stout, increasing in width posteriorly, hollow, marked by slender lines of growth and threadlike axial riblets.

The type (Cat. No. 363133 U.S.N.M.) was collected by C. R. Orcutt in river drift near Rio Balsas Station, Guerrero, Mexico. It has 17.8 whorls and measures—length, 19.1 mm.; diameter, 4.6 mm.

Cat. No. 363134 U.S.N.M. contains 80 topotypes which yield the following measurements:

	Number of whorls	Length	Diameter
Greatest.....	18.5	20.5	5.1
Least.....	13.0	13.9	4.3
Average.....	15.6	17.1	4.8

**HOLOSPIRA (COELOSTEMMA) IQUALAENSIS, new species**

Plate 1, fig. 12

Shell large, cylindroid, thin, semitranslucent, bluish white. Nuclear whorls 2.8, strongly rounded, all but the last half of the last one finely granulose, the axial rib sculpture of the postnuclear turns encroaching upon the last half postnuclear turn, but the riblets

are exceedingly poorly developed. The nucleus is flattened at the summit and gives to the apex a truncated appearance. The nuclear whorls plus the early postnuclear whorls increase regularly in size, forming a rather long, regularly conic apex. The middle portion of the postnuclear spire is almost cylindric, the whorls contracting but slightly from the eleventh, which is the broadest, anteriorly. The postnuclear whorls are marked by slender, well-developed, slightly curved, retractively slanting axial riblets, which on the conical portion of the spire are about one-third as wide as the spaces that separate them. On the middle turns these riblets become much more numerous, sinuous and retractively slanting. Here they are about half as wide as the spaces that separate them. On the last turn they again become somewhat strengthened, though not nearly as much so as on the early turns, and also a little more distantly spaced. Suture well constricted. Periphery of the last whorl obscurely angulated. Base well rounded, narrowly openly perforated. The last portion of the last whorl is solute, and here the riblets become decidedly irregular, closely spaced and crowded, encircling the entire outer surface of the turn. Aperture rather large, subquadrate with the peristome reflected and expanded, particularly so basally; parietal wall sinuous.

The type (Cat. No. 363135 U.S.N.M.) was collected by C. R. Orcutt at Iquala, Guerrero, Mexico. It has 17.9 whorls and measures—length, 25.4 mm.; diameter, 7.3 mm.

**HOLOSPIRA (BOSTRICHOCENTRUM) EURYBIA, new species**

Plate 1, fig. 2

Shell small, pupoid, bluish white, with the cone flesh colored. Nuclear whorls 2.2, well rounded, all but the last half marked with fine granules only. In the latter the beginnings of the axial ribs of the postnuclear spire make their appearance. The postnuclear turns form a broad cone which extends over the first four turns at the end of which the greatest diameter is reached, and the rest of the postnuclear spire begins to slowly contract. The early postnuclear whorls are moderately rounded and marked by strong, rather distantly spaced curved axial riblets. The middle whorls have the riblets a trifle less strong and a little more closely spaced, while on the last turn the riblets become stronger and again more distantly spaced. Suture well marked. Periphery of the last whorl obtusely angulated. Base short, strongly curved, rimate, marked by the continuations of the axial ribs. The last whorl is solute for a little distance, with a strong angle behind the posterior angle of the aperture and a less strong one at the junction of the inner and parietal wall. The solute portion is marked by ribs which are scarcely diminished

in strength, and encircle the entire whorl. Aperture subtriangular, peristome expanded and reflected. The internal pillar is rather thick, but decidedly reduced at the last whorl, with a strong fold which reaches its highest development in the penultimate turn and slowly diminishes posteriorly.

The type (Cat. No. 86147 U.S.N.M.) was collected by C. R. Orcutt in river drift near Rio Balsas Station, Guerrero, Mexico. It has 12.2 whorls, and measures—length, 11.5 mm.; diameter, 4.5 mm.

**HOLOSPIRA (TRISTEMMA) MELEA, new species**

Plate 1, fig. 11

Shell small, soiled white with the apex pale brown. Nuclear whorls  $2\frac{1}{2}$ , well rounded, forming a conic spire, all but the last half whorl smooth excepting fine granules; the latter, however, has feeble retractively slanting irregular riblets. The early postnuclear whorls form a rather slender cone, all moderately well rounded, the first marked by rather strong, retractively slanting, axial ribs which become obsolete shortly after leaving this whorl, reappearing again as low, rounded, almost vertical, distantly spaced ribs on the last turn. Suture moderately constricted. Periphery well rounded. Base short, well rounded, narrowly umbilicated, marked by the continuations of the axial ribs. The last whorl is solute for a little distance, and bears a strong angle behind the posterior angle of the aperture. The solute portion is marked by slender, closely spaced axial riblets which encircle the whorl. The aperture forms a decided angle at the posterior angle; parietal wall somewhat sinuous, outer lip slightly expanded and slightly reflected. The internal axis is slender without fold in the last whorl. On the penultimate turn the parietal fold develops and reaches its maximum development although it extends into the antepenultimate whorl. At the penultimate turn also the basal fold reaches its fullest strength, but there is no indication of a labial fold.

The type (Cat. No. 363145 U.S.N.M.) was collected by C. R. Orcutt on the roots of orchids at Ixcaquixtla, Puebla, Mexico. It has 12.6 whorls, and measures—length, 13.9 mm.; diameter, 4.2 mm.

**HOLOSPIRA (BOSTRICHOCENTRUM) GALATHEA, new species**

Plate 1, fig. 6

Shell small, pupoid, milk white, excepting the cone which is flesh colored. Nuclear whorls 2.2, well rounded, all but the last half whorl marked by fine granules only. The beginning of the latter shows rather distantly spaced axial riblets. The postnuclear whorls form a broad cone, while the middle portion is cylindric. The whorls

on the cone are moderately well rounded and marked by numerous retractively slanting axial riblets which increase in number and decrease in strength. On the middle portion of the spire these riblets become reduced and are almost obsolete. Suture well impressed. Periphery of the last whorl very strongly angulated. Base short, well rounded, narrowly openly umbilicated, last whorl not solute. Aperture subtriangular, peristome expanded and reflected. The internal pillar rather stout, decidedly attenuated at the last turn. There is a moderately strong fold in the penultimate whorl which extends feebly into the three whorls posterior to it.

The type (Cat. No. 363148 U.S.N.M.) was collected by C. R. Orcutt in river drift near Rio Balsas Station, Guerrero, Mexico. It has 12.2 whorls, and measures—length, 11.3 mm.; diameter, 4.1 mm. Cat. No. 363149 U.S.N.M. contains a paratype which is not quite perfect.

**HOLOSPIRA (TRISTEMMA) HYPERIA, new species**

Plate 1, fig. 15

Shell small, cylindro-conic, bluish white. Nuclear whorls 2.1, forming a rather broad apex, well rounded, marked by fine granules only. Postnuclear whorls forming a rather broad moderately long apex, the apical portion well curved and marked by rather strong, retractively slanting axial ribs which are a little less wide than the spaces that separate them. Beyond the cone these ribs become decidedly obsolete, reappearing only upon the last whorl where they are also only poorly developed. Suture rendered conspicuous by the somewhat overhanging tendency of the whorls. Periphery of the last whorl well rounded. Base short, well rounded, narrowly umbilicated. Last whorl not solute. Aperture moderately large, subtriangular, with a decided angle at the posterior angle. Internal axis moderately broad but decidedly contracted in the last turn, at the posterior extremity of which the parietal fold begins and extends up into the penultimate whorl, disappearing upon reaching the antepenultimate turn. The parietal fold and basal fold also attain their maximum development in the penultimate whorl. There is no indication of a labial fold.

The type (Cat. No. 363146 U.S.N.M.) was collected by C. R. Orcutt at Esperanza, Puebla, Mexico. It has 14 whorls, and measures—length, 13 mm.; diameter, 4.3 mm. Cat. No. 363147 U.S.N.M. contains two paratypes which are incomplete.

**HOLOSPIRA (HOLOSPIRA) ALVAREZENSIS, new species**

Plate 1, fig. 7

Shell small, cylindroid, pale brown. Nuclear whorls 3.1, large, forming a truncated cylindric apex. All but the last half of the

last turn finely granulose. The latter shows the encroaching ribs of the postnuclear sculpture in an enfeebled state. Postnuclear whorls well rounded, increasing gradually in size, forming a very regular apical cone. The cone portion marked by rather strong retractively slanting axial riblets which are about one-half as wide as the spaces that separate them. In the central portion of the shell the whorls are crossed by rather flexuose, retractively slanting riblets which are much finer and a little more closely spaced than those on the cone. On the last two turns the ribs again increase in strength, becoming even a little stronger than those on the cone, but here they retain the flexuose aspect of the middle turns. Suture strongly constricted. Periphery of the last whorl rounded. Base short, well rounded, narrowly perforated. The last whorl is solute at its extremity and marked on the outside by riblets which are continuous all around, but here a little more closely spaced and less regular than on the preceding portion of the turn. Aperture subtriangular, the parietal portion being somewhat sinuous. Peristome continuous, expanded, and slightly reflected. In a ground-down specimen the pillar is found to be slender with a rather strong fold on the columella which extends through a little more than the last two whorls. The parietal fold is rather strong and reaches its greatest development in the next to the last turn where the basal lamella also is most strongly developed. Here, too, the short labial fold is present.

The type (Cat. No. 363136 U.S.N.M.) was collected by C. R. Orcutt near Alvaras, San Luis, Potosi, Mexico, at an altitude of 6,000 to 9,000 feet. It has 14.5 whorls, and measures — length, 10.7 mm.; diameter, 2.5 mm.

Eight additional specimens, paratypes, three of which are complete, yield the following measurements:

	Number of whorls	Length	Diameter
Greatest.....	15.8	12.1	2.8
Least.....	14.2	10.7	2.5
Average.....	14.8	11.4	2.7

#### HOLOSPIRA (HOLOSPIRA) ANDROMEDA, new species

Plate 1, fig. 8

Shell of medium size, pale brown, with the ribs almost white. Nuclear whorls  $2\frac{3}{4}$ , forming a conspicuous broad cylindroid apex. The nuclear whorls are well rounded, all but the last half of the last turn being granular. On the latter there are also feeble axial riblets which slowly increase in size toward the postnuclear spire. Postnuclear whorls increasing slowly in size, early whorls well rounded, marked by exceedingly strong lamellar, somewhat sinuous, retrac-



tively slanting, axial riblets. On the middle turns these riblets become only a trifle less strong. On all the whorls they are less than half the width of the spaces that separate them. On the last two turns they again increase materially in size. Suture moderately constricted. Periphery angulated. Base short, almost flattened, narrowly perforated, marked by the somewhat enfeebled continuations of the axial ribs. The last portion of the last whorl is solute, and has the axial ribs encircling it as bands. On the extreme last portion, immediately behind the peristome, they become enfeebled and closely crowded. Aperture moderately large, subtriangular; parietal wall sinuous; peristome expanded and reflected. The internal pillar is slender, somewhat twisted, and in the last  $3\frac{1}{2}$  whorls there is a very strong submedian fold which reaches its highest development in the third to last turn. Here, too, the parietal fold reaches its greatest development. This is suspended vertically from the roof of the turn and its basal portion is bent outward almost at right angles to the main portion. The basal lamella, too, finds its greatest development in this turn, as does the labial fold.

The type (Cat. No. 363138 U.S.N.M.) was collected by C. R. Orcutt. Unfortunately no specific locality is cited. It has 17.4 whorls and measures—length, 13.5 mm.; diameter, 3 mm. Twenty-five paratypes (Cat. No. 363139 U.S.N.M.) are present, 9 of which are complete and yield the following measurements:

	Number of whorls	Length	Diameter
Greatest.....	17.0	14.2	3.4
Least.....	15.0	11.5	2.9
Average.....	15.4	12.7	3.9

**HOLOSPIRA (HOLOSPIRA) CREIGHTONI, new species**

Plate 1, fig. 4

Shell cylindroid, pinkish white. Nuclear whorls 2.2, strongly rounded, increasing slowly in size, marked by fine granules only, the early postnuclear whorls forming a slender cone; the first 3 well rounded, marked by moderately strong, decidedly retractorily slanting axial riblets, the rest almost smooth excepting the last  $2\frac{1}{2}$ , on the first of which the ribs again become apparent, while on the last they are quite strong. The last whorl is decidedly attenuated anteriorly. Periphery rounded. Base short, narrow, well rounded, with an umbilical chink. The last portion of the last whorl is solute and bears a strong carina at the posterior angle of the aperture and an obsolete one at the junction of the inner lip and parietal wall. On this portion of the whorl the axial ribs are very much reduced, form-

ing numerous closely appressed slender threads which have almost the appearance of lamellae. These threads encircle the entire whorl. Aperture subtriangular, peristome thin, expanded and reflected. The internal axis is moderately large and hollow; in the last whorl it is rather slender without even a twist. In the penultimate whorl a very strong fold develops on the middle of the pillar which almost disappears in the next whorl posterior to it. In the penultimate whorl also the strong parietal fold develops and reaches its maximum strength, almost disappearing in the whorl posterior to it. The same holds good of the basal fold. The parietal fold also is present in the penultimate whorl but not in the whorl posterior to it.

The type (Cat. No. 362178 U.S.N.M.) was collected by C. R. Orcutt on a hill east of San Pedro, San Luis Potosi, Mexico. It has 14.2 whorls and measures—length, 17.6 mm.; diameter, 4.1 mm.

Cat. No. 362179 U.S.N.M. contains 16 paratypes, 10 of which are perfect and yield the following measurements:

	Number of whorls	Length	Diameter
Greatest.....	14.5	18.3	4.1
Least.....	13.0	13.7	3.7
Average.....	13.7	16.3	3.9

I take pleasure in naming this specimen for Thomas Creighton, to whom I am indebted for many hours of painstaking help in the preparation of material for description.

**HOLOSPIRA (HOLOSPIRA) AMALTHEA, new species**

Plate 1, fig. 13

Shell elongate-conic, pale brown. Nuclear whorls  $2\frac{1}{2}$ , well rounded, finely granular. Postnuclear whorls increasing slowly in size, appressed at the summit, the early ones moderately rounded, the middle ones almost flattened, and the later ones again moderately rounded. Those following the nuclear turns marked by strong retractorily slanting axial riblets which are distantly spaced; while the ribs on the next three turns become enfeebled and finally vanish in mere incremental lines. On the last whorl the ribs again appear, becoming fairly well developed on the later portion of the last turn. Suture well marked. Periphery of the last whorl obtusely angulated. Base short, well rounded, rimate, marked by the continuation of the axial riblets. Last whorl solute with a strong angle behind the posterior angle of the aperture and a lesser one at the junction of the outer and basal lip. The last whorl is marked behind the aperture by numerous closely spaced irregular axial riblets which completely encircle the whorl. Aperture broadly ear shaped, decidedly angulated at the posterior angle; outer lip broadly expanded and re-

flected. The internal pillar very broad in the antepenultimate whorl and the one preceding it, narrowing posteriorly and anteriorly. In the last portion of the penultimate whorl the parietal fold begins to make its appearance and extends posteriorly for two turns, reaching its maximum development in the antepenultimate turn where also the parietal fold is present, strongly developed, and decidedly out-curved at its free margin. The basal fold here also is strongly developed as is the labial fold.

The type (Cat. No. 363140 U.S.N.M.) was collected by C. R. Orcutt at Monterey, Nueva Leon, Mexico. It has 15.3 whorls and measures—length, 16 mm.; diameter, 4.3 mm.

Cat. No. 363141 U.S.N.M. contains 31 topotypes, which yield the following measurements, and a number of fragments:

	Number of whorls	Length	Diameter
Greatest.....	16.2	20.3	4.5
Least.....	11.1	12.1	4.0
Average.....	14.2	15.9	4.4

**HOLOSPIRA (HOLOSPIRA) MITRAENSIS, new species**

Plate 1, fig. 9

Shell cylindroid, white. The type, the only specimen before us, consists of almost the last five whorls. It is sufficiently peculiar to merit description. Whorls moderately rounded, marked by obsolete axial riblets which are a little more strongly developed on the last whorl than on the earlier ones, but even here they are very poorly expressed. Suture moderately constricted. Periphery well rounded. Base short, very strongly rounded, narrowly openly umbilicated, marked by the continuation of the axial riblets. The last whorl is solute and is marked by moderately closely spaced, rather irregular axial threads which encircle the whorls. There is also a strong angle present on this portion behind the posterior angle of the aperture and a less pronounced angle behind the junction of the columella and parietal wall. Aperture rather large, with a strongly expanded and reflected peristome. The internal axis is hollow, very narrow in the last whorl, and a little less so in the penultimate. A slender columnellar fold begins in the penultimate whorl and extends through the two whorls preceding this, reaching its highest development in the fourth to last turn where also the parietal and basal lamellae, which are almost confined to this turn, attain their highest development. Here, too, the slender labial fold is present.

The type (Cat. No. 363142 U.S.N.M.) was collected by C. R. Orcutt at La Mitra Mountain, Monterey, Nueva Leon, Mexico. Length, 8.9 mm.; diameter, 3 mm.

This species strongly resembles *Holospira* (*Holospira*) *topochicoana*, distinguished from it at a glance, however, by its minute size.

**HOLOSPIRA (HOLOSPIRA) BACHIA, new species**

Plate 1, Fig. 10

Shell small, rather stout, cylindro-conic, pale brown with white ribs. Nuclear whorls 3, well rounded, forming an almost cylindrical spire which is truncated at the apex, all but the last half turn marked with fine granules only; the last half whorl is marked by somewhat irregular, poorly developed, axial riblets, which are much more distantly spaced than those on the postnuclear spire. The early whorls of the postnuclear spire are moderately rounded and form a rather long cone. They are marked by moderately, distantly spaced decidedly retractorily slanting, somewhat sinuous axial riblets which increase in number and proximity as the whorls progress. On the middle whorls they are about as wide as the spaces that separate them and well developed. On the last turn they become less in number, wider spaced and stronger. Suture well impressed. Periphery of the last whorl well rounded. Base very short, strongly rounded, narrowly umbilicated, marked by the continuations of the ribs which extend into the umbilical chink. The last whorl is solute for a little distance. On this portion the axial riblets become much enfeebled, very closely spaced and encircle the entire whorl. Behind the posterior angle of the aperture is an obsolete keel. Aperture subtriangular; parietal wall somewhat curved, peristome expanded and slightly reflected. The internal pillar is moderately strong, hollow; in the last turn it is much more slender than in those preceding. The columellar fold begins on the last half of the last turn and reaches its maximum development in the penultimate whorl, where also the outcurved parietal fold and the basal fold, as well as the rather slight labial fold, reach their maximum development. None of these folds except the columellar twist extend posterior to the penultimate turn.

The type (Cat. No. 363152 U.S.N.M.) was collected by C. R. Orcutt in river drift near the Rio Balsas Station, Guerrero, Mexico. It has 13.1 whorls and measures—length, 12.7 mm.; diameter, 4.3 mm. Cat. No. 363153 U.S.N.M. contains three additional specimens which yield the following measurements:

	Number of whorls	Length	Diameter
Greatest.....	14.5	14.7	4.9
Least.....	13.1	11.9	3.5
Average.....	13.5	13.3	4.3

## HOLOSPIRA (HOLOSPIRA) PEDROANA, new species

## Plate 1, fig. 3

Shell large, cylindro-conic, very pale brown, almost white. Nuclear whorls 2.5, well rounded, marked by very fine granules, forming a truncated cylindrical apex. Postnuclear whorls increasing slowly in size, well rounded, marked by very distantly spaced, low, rounded, retractively slanting axial ribs which are strongest on the early turns. On the middle turns they become almost obsolete and very far apart. On the last two whorls they again become stronger and on the last they are almost lamellar. The last whorl is decidedly contracted toward the base. Suture well impressed. Periphery of the last whorl well rounded. Base rather short, narrowly umbilicated, marked by the continuations of the axial ribs. The last third of the last whorl is decidedly solute with a very strong angle behind the posterior angle of the aperture, and an obsolete angle behind the junction of the inner and parietal wall. The solute portion is marked by very irregular more or less fused axial riblets which encircle the whorls. Aperture subtriangular, parietal wall somewhat sinuous, peristome decidedly expanded and strongly reflected. The internal pillar is slender, somewhat twisted in the last turn and without columellar fold here. In the penultimate turn and the turn preceding this, a slender, columellar fold is apparent. In the antepenultimate whorl also the strongly outturned parietal wall is present and well developed. Here, too, a short basal fold is apparent, and a very weak labial fold is present in the narrow gap between the two.

The type (Cat. No. 362176 U.S.N.M.) was collected by C. R. Orcutt under agave in the hills north of San Pedro, San Luis Potosi, Mexico. It has 17.2 whorls and measures—length, 20.9 mm.; diameter, 4.4 mm.

Four paratypes (Cat. No. 362177 U.S.N.M.) yield the following measurements:

	Number of whorls	Length	Diameter
Greatest.....	14.3	23.3	4.4
Least.....	18.5	16.4	3.9
Average.....	16.2	19.4	4.1

## HOLOSPIRA (HOLOSPIRA) TOPOCHICOANA, new species

## Plate 1, fig. 5

Shell rather large, milk white. Nuclear whorls  $2\frac{1}{2}$ , well rounded, forming a narrow blunt cone. Postnuclear whorls flattened with the summit almost appressed, the first marked by rather strong retractively slanting distantly spaced axial riblets which be-

come decidedly enfeebled on the next three turns, disappearing shortly thereafter. The middle whorls are smooth, excepting coarse incremental lines. On the last turn the riblets again become apparent and on the last portion of the last turn are very strong. Suture slightly impressed. Periphery of the last whorl broadly obtusely angulated. On the last whorl there is a constriction a little posterior to the periphery which becomes decidedly apparent as the whorls progress, so that the outer portion of the last whorl behind the aperture is decidedly concave. The last whorl is solute at its extremity, bearing a conspicuous broad keel behind the posterior angle of the aperture. The solute portion is marked by numerous closely spaced riblets which appear like obsolete lamellae. Aperture subquadrate, the outer lip and parietal wall somewhat sinuous, peristome broadly expanded and reflected. The internal axis is moderately thick, hollow, decidedly contracted in the last whorl and a little less so in the penultimate. In the latter turn the columellar fold begins as a slender cord and reaches its greatest development in the whorl preceding this. Here, too, the outturned strong parietal lamella appears and disappears. The same holds true of the basal fold and the slender labial cord.

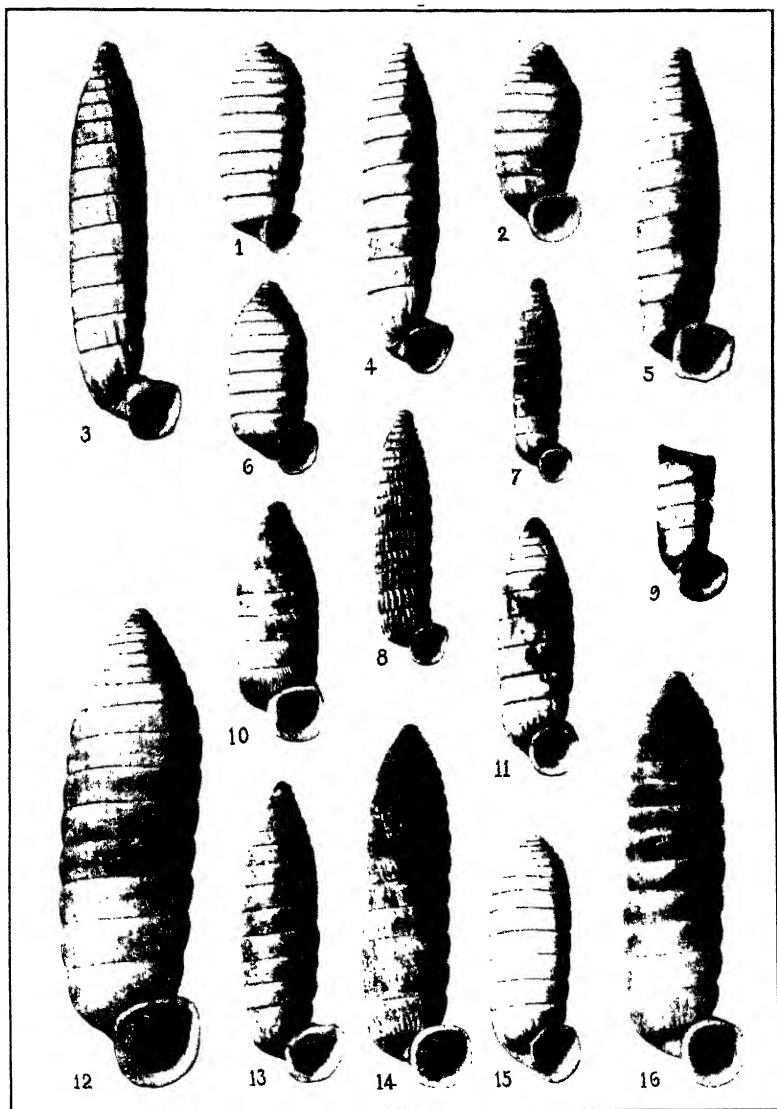
The type (Cat. No. 363143 U.S.N.M.) was collected by C. R. Orcutt at Topochico Mountain, Monterey, Nueva Leon, Mexico. It has 15.4 whorls and measures—length, 17.8 mm.; diameter, 4.5 mm. Cat. No. 363144 U.S.N.M. contains five fragments of paratypes.

#### EXPLANATION OF PLATES

- FIG. 1. *Holospira* (*Coelostemma*) *adria*.  
 2. *Holospira* (*Bostrichocentrum*) *eurybia*.  
 3. *Holospira* (*Holospira*) *pedroana*.  
 4. *Holospira* (*Holospira*) *creightoni*.  
 5. *Holospira* (*Holospira*) *topochicoana*.  
 6. *Holospira* (*Bostrichocentrum*) *galathea*.  
 7. *Holospira* (*Holospira*) *alvarezensis*.  
 8. *Holospira* (*Holospira*) *andromeda*.  
 9. *Holospira* (*Holospira*) *mitraensis*.  
 10. *Holospira* (*Holospira*) *bachia*.  
 11. *Holospira* (*Tristemma*) *melea*.  
 12. *Holospira* (*Coelostemma*) *igualaensis*.  
 13. *Holospira* (*Holospira*) *amalthaea*.  
 14. *Holospira* (*Coelostemma*) *adana*.  
 15. *Holospira* (*Tristemma*) *hyperia*.  
 16. *Holospira* (*Coelostemma*) *balsasensis*.







NEW UROCOPTID LAND SHELLS FROM MEXICO

FOR EXPLANATION OF PLATE SEE PAGE 13





A COLLECTION OF BIRDS FROM THE PROVINCES OF  
YUNNAN AND SZECHWAN, CHINA, MADE FOR THE  
NATIONAL GEOGRAPHIC SOCIETY BY DR. JOSEPH F.  
ROCK

By J. H. RILEY

*Aid, Division of Birds, United States National Museum*

During explorations for the National Geographic Society in southwestern China Dr. Joseph F. Rock, in connection with other collections in natural history, took advantage of the opportunity to secure an excellent series of birds, which, upon his return, were presented with other material by the National Geographic Society to the United States National Museum. The collection is remarkably complete in that it includes skins of most of the larger forms which few collectors trouble to prepare, particularly when traveling under difficult conditions, as in the present case. The specimens received, all beautifully prepared by native workmen, are a distinct addition to the division of birds in that they constitute one of the largest accessions of recent years and that they represent an area from which we had practically no material previously. Among them are species hitherto unknown to science, as well as an excellent representation of birds described from previous expeditions and rare in museums, since they are restricted in range to this area, a region difficult of access. Doctor Rock is to be complimented upon his energy and interest in procuring so excellent a representation.

Doctor Rock began his ornithological work in Yunnan early in March, 1923, in the vicinity of Tengyueh, near the Burma border, and started northeast for the Likiang Snow Mountains, which were reached early in April. Here he worked in the mountains or surrounding plains until September, when he went northwest to the valley of the Mekong in northwestern Yunnan to collect during October and November on various ranges of mountains between the Yangtze and Mekong. Most of these ranges are nearer the Mekong than they are to the Yangtze, except the Litiping Mountains, which form the divide between the two streams and are about midway between them, just north of where the Yangtze turns abruptly north

to form the big bend shown on maps. These various ranges must be of considerable height, though the altitudes from available information are uncertain. At one point there was taken a new species of blood pheasant (*Ithaginis*), a group that is only found at considerable elevations. From the valley of the Mekong, Rock turned east again and collected for a short while on the plain of Youngning, just east of the big bend of the Yangtze, and then crossed over into the southwest Szechwan to visit in the latter part of February, 1924, the independent lama kingdom of Muli or Mili on the Litang River. This was the only work done outside of Yunnan and ended the collection of birds for the trip.

The result of the year's bird collecting was something over 1,600 excellent skins, which were splendidly packed and reached their destination in Washington in fine shape.

Doctor Rock has issued <sup>1</sup> two beautifully illustrated articles dealing with the country traversed. A small map that he has published of the northern part of the territory explored indicates most of the localities mentioned in the following report.

Three birds in this collection have turned out to be apparently unnamed.<sup>2</sup> The collection as at present worked out contains 244 forms, which is a remarkable showing for a collector busied largely in the procuring of plants.

J. D. La Touche has published <sup>3</sup> an account of a collection made by himself in southeast Yunnan, wherein is given a list of the important papers on the ornithology of the Province, which need not be repeated here. Since his paper was written three large additional collections have been received by the Tring Museum and reported upon by Lord Rothschild.<sup>4</sup> The birds collected by the Stötzner expedition have been worked out at the Dresden Museum by various specialists,<sup>5</sup> but only the early parts of the report had reached the United States when this manuscript was completed. The route on this last expedition seems to have been more to the north through Szechwan. The two volumes of the Fauna of British India, Birds, second edition, by Stuart Baker, so far published completes the list of important ornithological papers and works on this part of China in recent years.

The present list is published as a record of the fine collection made by Doctor Rock, trusting it may add something of interest to the distribution and taxonomy of the birds of this part of China, as yet

<sup>1</sup> National Geographic Magazine, vol. 46, 1924, pp. 478-499; vol. 47, 1925, pp. 447-492; also consult Gilbert Grosvenor, idem, vol. 47, 1925, pp. 493-498.

<sup>2</sup> *Ithaginis rocki* and *Stria aluco nivipetens* Riley, Proc. Biol. Soc. Wash., vol. 38, 1925, pp. 9-12; and *Luscinia davidi gloriosa* Suschkin, "Auk," vol. 43, April, 1926, pp. 181-183.

<sup>3</sup> Ibis, 1923, pp. 300-332, 369-415, 629-645, 1924, pp. 284-307.

<sup>4</sup> Nov. Zool., vol. 30, 1923, pp. 33-53, 247-267; vol. 32, 1925, pp. 292-313.

<sup>5</sup> Vorwort: Abhandl. u. Berichte des Zool. u. Anth.-Ethn. Museums zu Dresden, vol. 15, 1922, pp. iii-viii, and in following volumes.

none too well known. I have made my remarks on the forms brief, only adding such notes as will be of use to future workers in the same general region.

I am indebted to Outram Bangs for the identification of three species of the following list.

#### ANNOTATED LIST

### Family PHASIANIDAE. Pheasants, etc.

#### 1. TETRAOPHISIS SZECHENYII Madarasz

*Tetraophasis szechenyii* MADARASZ, Zeitschr. f. ges. Orn., vol. 2, 1885, p. 50, pl. 2 (East Tibet).

One male, Likiang Mountains, 16,000 feet, June 14; one male and one female, Mount Dyinaloko, 13,000 feet, Abies forest, June; one male and two females, Hofuping Mountains, Mekong Valley, November.

#### 2. COTURNIX COTURNIX JAPONICA Temminck and Schlegel

*Coturnix vulgaris japonica* TEMMINCK and SCHLEGEL, Fauna Japon. Aves, 1849, p. 103, pl. 61 (Japan).

One adult female, Likiang Plain at Pöshaka, 8,500 feet, August. A dark richly colored bird.

#### 3. ITHAGINIS CLARKEI Rothschild

*Ithaginis clarkei* ROTHSCHILD, Bull. Brit. Orn. Club, vol. 40, 1920, p. 67 (Likiang Range, Yunnan).

Four males and one female, Likiang Mountains, 13,000 feet, May-June.

Not one of the males is exactly alike. Only one lacks red on the throat and chest, though in one of the others the red on the chest is much reduced. In one male the throat and chin is pronouncedly tinged with red, and it even extends onto the cheeks. All the males have the chest tinged more or less, with cinnamon-buff and in three the forenecks and throats also. The male with the throat and cheeks strongly tinged with red approaches *Ithaginis rocki*, but the bill is larger, the crest longer and more decomposed, the forehead black, and the cere (in the skin) red. The red of the throat is deeper and more restricted and that of the chest reduced to more or less of a trace and the cinnamon streaks on the foreneck and chest intensified in *Ithaginis clarkei* also. The only male of *Ithaginis geoffroyi* available for comparison has much less red on the under tail coverts than any of the specimens of *Ithaginis clarkei* before me, but the specimen of the latter without any red on the throat or chest is similar.

The male of *Ithaginis clarkei* has a larger, heavier bill than *Ithaginis rocki*, and the cere and bare skin around the eye is red in the skin (cream buff in *rocki*). The bill and cere is dull black in the

female of *Ithaginis clarkei* (in the skin); red with only the cere and extreme base blackish in *Ithaginis rocki*.

Rothschild<sup>6</sup> reduces *Ithaginis clarkei* to a race of *Ithaginis geoffroyi*, but *Ithaginis rocki* is a connecting link to *Ithaginis cruentus*, so it would seem that even *Ithaginis geoffroyi* would have to be reduced to a race of that species or treat them all binomially; I have adopted the latter course for the present.

#### 4. ITHAGINIS ROCKI Riley

*Ithaginis rocki* RILEY, Proc. Biol. Soc. Wash., vol. 38, 1925, p. 9 (Hofuping Mountains, Mekong Valley, Yunnan).

Three males and three females, Hofuping Mountains, Mekong Valley, November.

Similar to *Ithaginis kuseri* Beebe, but ear coverts broadly streaked with grayish-white and the lores black not red.

There are no specimens of *I. kuseri* available for comparison. I have had to rely upon descriptions and the plate of the head given by Stuart Baker.<sup>7</sup> The above birds do not fit the descriptions or the plate, and as there did not appear to be any described form to which they could be referred, I named it after its discoverer.

One of the specimens marked as a female has the bill black, only red at the base of the lower mandible. In my opinion it is a young male, as the tarsi are heavier than in the female and have a budding spur. The female resembles the females of *Ithaginis clarkei* Rothschild, but the hind neck is not so extensively neutral gray; the forehead, cheeks, and throat are cinnamon-rufous, not tawny-olive; and the bills are smaller and red, only black basally, not wholly so.

The birds of this genus are residents of high mountain regions and seem incapable of crossing hot valleys. It would appear as if every isolated high-mountain mass within the range of the genus that had been sufficiently long uplifted might have its own local race. When the same form occurs upon two or more disconnected mountain ranges it tends to show that at one time there must have been a connection and that they are near the same geologic age. The distribution and relationships of the various forms are too imperfectly known as yet for any one to dogmatize.

#### 5. TRAGOPAN TEMMINCKII (Gray)

*Satyra temminckii*, J. E. GRAY, Ill. Ind. Zool., vol. 1, 1830-32, pl. 50 (China).

Three adult males, four immature males, four females, and one downy young from Mount Dyinaloko, 12,000 feet, April 27; Likiang Mountains, July; Hofuping Mountains, November.

<sup>6</sup> Nov. Zool., vol. 30, 1923, p. 247.

<sup>7</sup> Ibis, 1915, pl. 3, fig. 3.

The downy chick was taken in July.

One of the adult males has the neck lappet and horns enormously developed (April 27).

#### 6. CROSSOPTILON CROSSOPTILON CROSSOPTILON (Hodgson)

*Phasianus crossoptilon* HODGSON, Journ. Asiatic Soc. Bengal, vol. 7, 1838, p. 864, pl. 46 (Tibet).

One male, Likiang Mountains, 14,000 feet, August 16.

Doctor Rock informs me that this species was quite common at high altitudes; so common in fact that he thought it must be better known and only had the one bird preserved.

#### 7. PHASIANUS ELEGANS ELLIOT

*Phasianus elegans* ELLIOT, Ann. and Mag. Nat. Hist., ser. 4, vol. 6, 1870, p. 312 (Szechwan).

A good series of adults of both sexes and young from near Tsaochiang, March 19; Likiang Mountains, 10,000 feet June-August; Likiang Plain, east of Likiang Mountains, July 2; Ashi, banks of Yangtze, July; Kangpu Mountains, Mekong Valley, November.

Downy young just acquiring feathers on the back and in the wings were taken in the Likiang Mountains in July, and almost in adult plumage in August.

Two adult males from Tatsienlu, Szechwan, are not essentially different and in none of the males is there any indication of a white collar.

#### 8. CHRYSOLOPHUS AMHERSTIAE (Leadbeater)

*Phasianus amherstiae* LEADBEATER, Trans. Linn. Soc. Lond., vol. 16, 1828, p. 129, pl. 15 (Mountains of CochinChina).

A fine series of adults and immature from Likiang Mountains, 9,500–12,500 feet, April-June; Tseh Chung, Chödölo, Hofuping, and Yangtza Mountains, Mekong Valley, November.

A few of the old males have the thighs white with only a few small black spots; in the remainder the spots are numerous and pronounced.

### Family TRERONIDAE. Fruit Pigeons

#### 9. SPHENURUS SPHENURUS YUNNANENSIS La Touche

*Sphenocercus sphenurus yunnanensis* LA TOUCHE, Bull. Brit. Orn. Club, vol. 42, 1921, p. 13 (Lotukow, S. E. Yunnan).

A good series of adults, mostly males, from: Western slopes of Likiang Mountains, Ashi Road, May 24; east slopes of Likiang Mountains, Lentzuko, July; banks of the Yangtze, Ashi Road, July.

The series of males show little variation, but I only have one specimen of *Sphenurus s. sphenurus* for comparison. Rothschild<sup>s</sup>

<sup>s</sup> Nov. Zool., vol. 30, 1923, p. 36.

says the edgings to the secondaries are wider and more numerous in *S. s. yunnanensis*, but in the present series these are very narrow and rather inconspicuous; the other differences mentioned by him seem to hold and if our specimen of *S. s. sphenurus* is typical there are other differences. The upper back is distinctly neutral gray; the rump, middle tail feathers, and inner remiges not so yellowish green; the under tail coverts a deeper cinnamon-buff; and there are other slight differences.

### Family COLUMBIDAE. Pigeons and Doves

#### 10. COLUMBA LEUCONOTA LEUCONOTA Vigors

*Columba leuconota* VIGORS, Proc. Zool. Soc. Lond., 1831, p. 23 (Himalaya).

Two males and two females, mountains near Yangtza, November.

Two males from Kashmir have darker heads and browner mantles when compared with the Yunnan birds.

A series of five males and one female recently received from near Tatsienlu, Szechwan, are much lighter on the mantle than the Yunnan birds, and evidently belong to *Columba leuconota gradaria* Hartert.<sup>9</sup>

#### 11. COLUMBIA HODGSONI Vigors

*Columba hodgsoni* VIGORS, Proc. Zool. Soc. Lond., 1832, p. 16 (Nepal).

Two males, Likiang Mountains, 13,000 feet, May 10; one male, Ngaza, June.

### Family RALLIDAE. Rails, Gallinules, and Coots

#### 12. PORZANA BICOLOR Walden

*Porzana bicolor* WALDEN, Ann. and Mag. Nat. Hist., ser. 4, vol. 9, 1872, p. 47 (Sikkim).

One male, Likiang Plain near Lungwangmiao, 8,200 feet, August 22; two males and one female, Likiang Plain, August; one male and one female, Lanping Plain, 8,400 feet, June 3.

I have no typical specimens for comparison. The above series differ somewhat from Sharpe's description.<sup>10</sup>

The primaries are not externally rufescent brown but fuscous, and the under tail coverts are blackish.

#### 13. GALLINULA CHLOROPUS PARVIFRONS Blyth

*Gallinula parvifrons* BLYTH, Journ. Asiatic Soc. Bengal, vol. 12, 1843, p. 180 (Calcutta).

One male and one female, Chienchuan, May 29; one male and one female, Likiang Lake, 8,200 feet, August.

<sup>9</sup> Nov. Zool., 1916, p. 85.

<sup>10</sup> Cat. Birds Brit. Mus., vol. 23, p. 113.

## Family PODICIPIDAE. Grebes

## 14. POLIOCEPHALUS RUFICOLLIS POGGEI (Reichenow)

*Podiceps nigricans poggei* REICHENOW, Journ. f. Orn., 1902, p. 125 (Tschili, China).

One adult male, two adult females, and four young (one in the down), Likiang Lake, 8,200 feet, August.

## Family LARIDAE. Gulls

## 15. LARUS CANUS MAJOR Middendorff

*Larus canus*, var. *major* MIDDENDORFF, Sibir. Reise, Zool., vol. 2, pt. 2, 1853, p. 243, pl. 24, fig. 4 (Stanovoi Mts. to Ochotsch Sea).

One immature male, plain of Youngning, February.

## Family CHARADRIIDAE. Plovers

## 16. CHARADRIUS DUBIUS DUBIUS Scopoli

*Charadrius (dubius)* SCOPOLI, Del. Flor. et Faun. Insubr., vol. 2, 1786, p. 93 (Luzon).

One female, without data.

## 17. CHARADRIUS PLACIDUS Gray

*Charadrius placidus* GRAY, Cat. Mamm. etc. Nepal present. Hodgson, ed. 2, 1863, p. 70 (Nepal).

One male, Yetche, Mekong Valley, November; one male, without locality, March 26.

## Family IBIDORHYNCHIDAE. Sickie-bills

## 18. IBIDORHYNCHA STRUTHERSII Vigors

*Ibidorhyncha struthersii*, VIGORS, Proc. Zool. Soc. Lond., 1830, p. 174 (Himalayan Mountains).

One male, Whei Hsi Mountains, Whei Hsi River, November.

## Family SCOLOPACIDAE. Snipe and Sandpipers

## 19. TRINGA OCHROPUS Linnaeus

*Tringa ochropus* LINNAEUS, Sys. Nat., ed. 10, 1758, p. 149 (Sweden).

Two males and seven females from Nguluko, Likiang Mountains, 9,600 feet, May 5; Likiang Plain, 8,200 feet, August; Whei Hsi River, December.

## 20. ACTITIS HYPOLEUCUS (Linnaeus)

*Tringa hypoleucos* LINNAEUS, Sys. Nat., ed. 10, 1758, p. 149 (Sweden).

One male and one female, Likiang Plain, 8,200 feet, August; one male, Mountains above Tseh Chung, Mekong Valley, October; one male, Whei Hsi, Mekong Valley, October; one female, no locality.



21. *RHYACOPHILUS GLAREOLA* (Linnaeus)

*Tringa glareola* LINNAEUS, Sys. Nat., ed. 10, 1758, p. 149 (Sweden).

One male, Likiang Plain, 8,200 feet, August.

22. *CAPELLA SOLITARIA* (Hodgson)

*Gallinago solitaria* HODGSON, Gleanings in Science, vol. 3, 1831, p. 238 (Nepal).

One female, Luanko-Dyinaloko, 11,000 feet, April 27; one male and one unsexed, near Whei Hsi, November; one female, Heshwe, Likiang Mountains, 12,000 feet, February.

## Family ARDEIDAE. Herons

23. *ARDEA CINEREA JOUYI* Clark

*Ardea cinerea jouyi* CLARK, Proc. U. S. Nat. Mus., vol. 32, 1907, p. 468 (Seoul, Korea).

One male, foot of Likiang Mountains, 9,300 feet, September.

24. *NYCTICORAX NYCTICORAX NYCTICORAX* (Linnaeus)

*Ardea nycticorax* LINNAEUS, Sys. Nat., ed. 10, 1758, p. 142 (S. Europe).

One immature male, Likiang Plain, 8,200 feet, August.

25. *BUTORIDES JAVANICA JAVANICA* (Horsfield)

*Ardea javanica* HORSFIELD, Trans. Linn. Soc. Lond., vol. 13, 1821, p. 190 (Java).

Two males and one female, between Tuinakou and Likiang, Likiang Plain, May 18; four males and two females, Likiang Plain, 8,200 feet, August.

Only one specimen is adult, May 18, and even this one is in not fully adult plumage; the wing coverts and inner remiges are broadly bordered with sayal brown and pinkish cinnamon.

26. *ARDEOLA BACCHUS* (Bonaparte)

*Buphus bacchus* BONAPARTE, Consp. Gen. Av., vol. 2, 1855, p. 127 (Malay Peninsula).

One adult male, five immature males, and two immature females, Likiang Plain, 8,200 feet, August 18-20; one immature female, Likiang Mountains, 10,000 feet, September.

## Family ANATIDAE. Ducks, etc.

27. *CASARCA FERRUGINEA* (Pallas)

*Anas (ferruginea)* PALLAS, Vroeg's Catal., 1764, Adumbr., p. 5 (Tartary).

One female, Kanhoten, March 27; one female, Likiang Mountains, 11,000 feet, June.

28. *ANAS POECILORHYNCHA HARINGTONI* (Oates)

*Polionetta haringtoni* OATES, Journ. Bombay Nat. Hist. Soc., vol. 17, 1907, p. 558 (Shan States).

One adult female and two downy young, Likiang Lake, 8,200 feet, August 20.

I have no specimens of *A. p. poecilorhyncha* or typical *A. p. haringtoni* for comparison, but have a good series from western Szechwan and five specimens of *A. p. zonorhyncha* from Japan and eastern China. The Szechwan specimens vary quite a little, but are not quite the same as the coast birds; the feathers of the back are more broadly edged with buffy as a rule, and the subterminal white bar on the greater wing coverts is broader and more pronounced. In fact, this white wing bar is only reduced or lacking in 3 out of 12 specimens, while in the others it is very noticeable, being as much as 10 mm. broad. The single female listed above from Yunnan agrees with those from Szechwan. As a matter of fact, the present race seems to be an intergrade between *A. p. poecilorhyncha* and *A. p. zonorhyncha*.

29. *NETTION CRECCA* (Linnaeus)

*Anas crecca* LINNAEUS, Sys. Nat., ed. 10, 1758, p. 125 (Europe).

One female, near Kanhoten, March 29; one female, Nguluko, April 13.

30. *MERGUS MERGANSER MERGANSER* Linnaeus

*Mergus merganser* LINNAEUS, Sys. Nat., ed. 10, 1758, p. 129 (Europe).

One female, Whei Hsi River, November; one female, Yangtze River at Chütien, November.

Both of these are marked as males, but apparently incorrectly so. They belong to the large, thick-billed form.

31. *MERGUS MERGANSER ORIENTALIS* Gould

*Mergus orientalis* GOULD, Proc. Zool. Soc. Lond., 1845, p. 1 (Amoy, China). \*

One female, between Tanten and Ssaching, March 24; one female, Yangtze River at Chütien, November.

These are small, narrow-billed birds. The exposed culmens measure: 44.5 and 44 mm., respectively.

## Family PHALACROCORACIDAE. Cormorants

32. *PHALACROCORAX CARBO SINENSIS* (Shaw and Nodder)

*Pelecanus sinensis* SHAW and NODDER, Nat. Misc., vol. 13, pl. 529, text 1801 (China).

One adult female still retaining the breeding plumage, Likiang Lake, August.

## Family FALCONIDAE. Hawks, etc.

## 33. CIRCUS CYANEUS CYANEUS (Linnaeus)

*Falco cyaneus* LINNAEUS, Sys. Nat., ed. 12, 1766, p. 126 (ex Edwards—London).

One immature male, Plain of Youngning, February.

## 34. ACCIPITER NISUS MELANOCHISTUS Hume

*Accipiter melanochistus* HUME, Ibis, 1869, p. 356 (Simla).

One immature male, Tseh Chung Mountains, Mekong Valley, November; one immature male and female, near Youngning, February.

## 35. BUTEO BUTEO JAPONICUS (Temminck and Schlegel)

*Falco buteo japonicus* TEMMINCK and SCHLEGEL, Fauna Japon. Aves, p. 16, 1844, pl. 6 and 6b, 1845 (Japan).

One male and one female, Chienchuan Plain, March 30; one male, Youngning Plain, February.

The above specimens illustrate three phases of plumage. The female has the chest cinnamon, the breast sepia with rusty and white markings, the thighs russet with a few faint buffy bars. The male taken March 30 has the thighs light seal brown and the chest muck streaked with white, while the male taken in February is mostly buffy white below with a few brownish streaks, the thighs sepia, with buffy margins to the feathers. The latter appears to be more like the usual coloration of the race. They appear to be considerably darker than specimens from more eastern localities.

## 36. MILVUS LINEATUS (Gray)

*Haliaeetus lineatus* GRAY, Hardwicke's Ill. Ind. Zool., vol. 1, pl. 18, p. 1, 1832 (China).

One adult male, Nguluko, 9,800 feet, April 20; one adult female and one adult unsexed, Likiang Plain, 8,200 feet, August and September; one adult female, Tseh Chung Mountains, November; one adult female, Plain north of Wualapi, Youngning, February.

## 37. FALCO REGULUS INSIGNIS (Clark)?

*Aesalon regulus insignis* CLARK, Proc. U. S. Nat. Mus., vol. 32, 1907, p. 470 (Fusan, Korea).

One adult male, Likiang Plain, 9,000 feet, April 14; one immature male, Youngning Lake, 10,000 feet, February.

The immature male is darker than the type of this race (also an immature male of about the same age) and the adult is a rather dark, richly colored specimen and very likely neither of these specimens belong to this race, but I do not know where else to place them. The wing of the adult measures 205 mm.

38. *FALCO SUBBUTEO STREICHI* Hartert and Neumann

*Falco subbuteo streichi* HARTERT and NEUMANN, Journ. für Orn., 1907, p. 592 (Swatow, S. China).

One female, Likiang Mountains, 8,200 feet, August. A rather dark richly colored bird; wing, 250 mm.

39. *CERCHNEIS TINNUNCULUS INTERSTINCTUS* (McClelland)

*Tinnunculus interstinctus* MCCLELLAND, Proc. Zool. Soc. Lond., 1840, p. 154 (Assam).

One adult and four immature males, and one adult and two immature females from Hsia-yan-tsun, March 29; Likiang Mountains, 8,200–11,000 feet, August–December; mountains near Yangtza, Mekong Valley, November.

## Family BUBONIDAE. Eared Owls

40. *BUBO BUBO SETSCHUANUS* Reichenow

*Bubo bubo setschuanus* REICHENOW, Orn. Monatsb., 1903, p. 86 (Setschwan).

One adult female, Tseh Chung Mountains, Mekong Valley, November.

In addition to the above specimen, the United States National Museum contains a male and a female from Chekiang Province, a female from the lower Yangtze near its mouth, and a male from southern Kansu, that allowing for certain slight individual differences, apparently all belong to one form.

They have been shown to Dr. Peter Suschkin, who has made a specialty of the palaearctic members of the genus, and he regards *Bubo bubo setschuanus* as a good form distinct from *B. b. kiautschensis* Reichenow and *B. b. swinhoei* Hartert<sup>11</sup> as a synonym of *B. b. setschuanus*.

The above specimen from Yunnan does not agree with the description of *Bubo bubo jarlandi* La Touche;<sup>12</sup> the primaries are pronouncedly barred below with dark brown.

41. *STRIX NIVIPETENS* Riley

*Strix aluco nivipetens* RILEY, Proc. Biol. Soc. Wash., vol. 38, 1925, p. 10 (Likiang Mts., 11,000 ft. Yunnan).

One adult male (type) and one unsexed, Likiang Mountains, 11,000 feet, April 15 and May 8.

The original diagnosis is as follows: "Similar to *Strix aluco nivicola* (Blyth), but much darker, the back and chest with the white spots replaced by ochraceous-buff, except those on the scapulars and greater wing coverts; flanks and feet ochraceous-buff; the face darker; under wing-coverts ochraceous-buff instead of buffy white;

<sup>11</sup> Vögel palaark. Fauna, vol. 2, Heft 8, 1913, p. 966.

<sup>12</sup> Bull. Brit. Orn. Club, vol. 43, 1921, p. 14.

bars on the tail darker and broader. Wing, 310; tail, 188; culmen from cere, 22 milimeters."

The second specimen is like the type above but lighter below. Both specimens are so different from *Strix aluco nivicola* or any of the related forms that it is doubtful if they are specifically related. For this reason I have now thought it best to raise it to specific rank.

Since writing the above the two specimens have been shown to Dr. Peter Suschkin and he agrees with me that they represent a distinct species. He has called my attention to certain differences that I failed to notice or mention. The most important is a difference in the structure of the wing. In *Strix nivicola* the second to fourth outer primaries are slightly notched on the outer web and slightly narrowed on the fifth, while in *Strix nivipetens* the notches on the outer web extend to the sixth primary and are more pronounced. In *Strix nivipetens* the six outer primaries are sinuated on the inner web, while in *Strix nivicola* only four are. The fifth primary is the longest in *Strix nivipetens*, the fourth and sixth equal and slightly shorter, the third slightly longer than seventh, while in *Strix nivicola* the fourth and fifth are subequal and longest, the third slightly shorter but longer than sixth. *Strix nivipetens* is a larger bird than *Strix nivicola*, with a slightly different color pattern, perfectly obvious to the eye but hard to define. The barring to the feathers above and below is coarser and darker, with an admixture of ochraceous-buff. The center of the belly is ochraceous-buff, unmarked in the type, but with a few obscure bars in the unsexed specimen, instead of the light buffish, almost white of *Strix nivicola*. This difference was not mentioned in the original description. There are other minor differences, both in color and structure, but enough has been given to show that this is a very distinct species. Doctor Suschkin is of the opinion that it represents a tropical type of the genus and has nothing to do with the northern races.

### Family PSITTACIDAE. Parrots

#### 42. PSITTACULA DERBIANA (Fraser)

*Palaeornis derbiana* FRASER, Proc. Zool. Soc. Lond., 1850, p. 245, pl. 25 (cage bird).

One male, and one female, near Hsia-yan-tsun, March 29; one male immature, Hofuping Mountains, Mekong Valley, November.

Shortly before receiving the Yunnan collection, the National Museum received two females purchased by the Rev. David C. Graham at Chengtu, Szechwan, which were said to have been brought from further south. One is apparently adult and the other a younger bird. The adult is not essentially different from the adult female from Yunnan; the younger bird has the forehead behind the black

band as far as the eyes, the fore part of the cheeks and the region around the eye bremen blue; below there is a more bluish sheen to the purple than in the adult. The immature male has the green of hind neck extend onto the occiput, and the purple of the lower parts is not so deep as in the adult.

While in color pattern *Psittacula derbiana* is like *Psittacula fasciata*, it is a much larger bird and the chest and breast are deep dull lavender (instead of orange-vinaceous washed with lavender), and this color extends further posteriorly; the under wing-coverts are green in *fasciata* and bluish lavender in *derbiana*.

#### 43. PSITTACULA SCHISTICEPS FINSCHI (Hume)

*Palaeornis finschi* HUME, Stray Feath., vol. 2, 1874, p. 509 (Kollidoo, Salwin R.).

A good series of adults and immature from: Limestone Range, east of Likiang Mountains, 10,000 feet, July 2; east slopes of Likiang Mountains, Yoshanlo, July; near Ashi, banks of the Yangtze, July; Likiang Plain, August; Lhiku Mountains on the Yangtze, November.

Most of this series is in molt or worn plumage. Only a male taken in November is in good, unworn plumage. Comparing this with *Psittacula s. schisticeps* it is smaller; the black cravat broader; the head more of a light-violet gray; the back more yellowish green; the tips of the longer tail feathers, except the extreme tips, buff yellow instead of lemon chrome; and there are other slight differences.

The specimens in molt with the central tail feathers about half grown or less, have the exposed part of the tail capucine buff, only the extreme tips lemon yellow; this fades as growth proceeds.

### Family CORACIIDAE. Rollers

#### 44. CORACIAS AFFINIS McClelland

*Coracias affinis* McCLELLAND, Proc. Zool. Soc. Lond., 1839, p. 164 (Assam).

One male, Likiang Plain, August; two males and four females, no definite locality.

I have only had one adult male from eastern Siam for comparison. The Yunnan birds have uniformly larger bills and the bend of the wing more extensively blue.

### Family ALCEDINIDAE. Kingfishers

#### 45. MEGACERYLE LUGUBRIS GUTTULATA (Stejneger)

*Ceryle guttulata* STEJNEGER, Proc. U. S. Nat. Mus., vol. 15, 1893, p. 294 (new name for *Alcedo guttata* Vigors, 1831, not Boddaert, 1783—Himalayas).

Two males Likiang Plain, 8,200 feet, August 22 and 23.

46. *ALCEDO ATTHIS BENGALENSIS* Gmelin

*Alcedo bengalensis* Gmelin, Sys. Nat., vol. 1, 1788, p. 450 (Bengalen).

Five males, Likiang Plain, 8,200 feet, August.

47. *HALCYON PILEATA* (Boddaert)

*Alcedo pileata* BODDAERT, Table Pl. Enl., 1783, p. 41 (China).

One male, north of Likiang, August.

48. *HALCYON SMYRNENSIS FUSCA* (Boddaert)

*Alcedo fusca* BODDAERT, Table Pl. Enl., 1783, p. 54 (Coast of Malabar).

One female, near Chüchi, March 12; one male, north of Likiang, 8,200 feet, August.

## Family UPUPIDAE. Hoopoes

49. *UPUPA EPOPS SATURATA* Lönnerberg

*Upupa epops saturata* LÖNNBERG, Arkiv för zool., vol. 5, No. 9, 1909, p. 29 (Kjachta, Transbaicalia).

One male, Feilung-chiao, Mekong Valley, March 20; one male, Chienchuan, 8,000 feet, June; one female, Likiang Plain, 8,200 feet, August; one male, Likiang, 8,500–9,000 feet, September.

These agree with specimens from central and north China. The race is not very well differentiated.

## Family CAPRIMULGIDAE. Goat Suckers

50. *CAPRIMULGUS INDICUS JOTAKA* Temminck and Schlegel

*Caprimulgus jotaka* TEMMINCK and SCHLEGEL, Fauna Japon. Aves, 1847, p. 37, pl. 12 (Japan).

Two males and one female, Likiang Mountains, 8,000–10,000 feet, April 10, July, and August.

## Family CUCULIDAE. Cuckoos

51. *HIEROCOCCYX SPARVERIOIDES* (Vigors)

*Cuculus sparverioides* VIGORS, Proc. Zool. Soc. Lond., 1832, p. 173 (Himalaya).

Two females and one unsexed, Likiang Mountains, 10,000–11,000 feet, May 26, June; one male, Likiang-Lashipa Plain, 8,400 feet, May 27.

52. *CUCULUS INTERMEDIUS INTERMEDIUS* Vahl

*Cuculus intermedius* VAHL, Skrivt. af Nat.-Selskabet, Kjobenhavn, vol. 4, 1789, p. 58 (S. India).

Two females, Likiang Mountains, June and July.

The July specimen is a young bird, not long from the nest, and the June specimen has a few feathers of the immature plumage still

remaining on the crown and foreneck, and the tail has been recently acquired and has not yet reached full growth.

### 53. CUCULUS OPTATUS Gould

*Cuculus optatus* GOULD, Proc. Zool. Soc. Lond., 1845, p. 18 (Port Essington, Australia).

A fair series of adults and immatures in various stages of plumage: Likiang Mountains, 8,300–10,000 feet, April 19–August; Likiang Plain, 8,200–8,400 feet, May 7 and August; between Kanhoten and Shayangching, June 4.

### 54. CACOMANTIS MERULINUS QUERULUS Heine

*Cacomantis querulus* HEINE, Journ. für Orn., 1863, p. 352 (India, Nepal, Burma).

One adult and one immature male, Likiang Mountains, 10,000 feet, September; one female still in immature plumage, Loyü, Yangtze Gorge, 7,600 feet, May 22.

## Family CAPITONIDAE. Barbets

### 55. CYANOPS ASIATICA (Latham)

*Trogon asiaticus* LATHAM, Ind. Orn., vol. 1, 1790, p. 201 (India).

One female, Monglei, Salwin Valley, March 14.

## Family PICIDÆ. Woodpeckers

### 56. PICUS CANUS SORDIDIOR (Rippon)

*Gecinus sordidior* RIPPON, Bull. Brit. Orn. Club, vol. 19, 1906, p. 32 (Yangtze Big Bend).

A good series: Likiang Mountains, 8,500–12,000 feet, May–August; pine forests three days north of Likiang, 10,000 feet, May 1; Hofuping Mountains (Mount Tola), October–November; pine forest north of Heshwe, 11,000 feet, February.

Most of this series is in worn faded plumage and not suitable for comparison. It seems that the Chinese forms of this species are in much need of revision but the proper material is not available at this time to undertake the task.

### 57. DRYOBATES MAJOR STRESEMANNI Rensch

*Dryobates major stresemanni* RENSCH, Abh. u. Ber. d. Mus. f. Tierk. u. Volkerk. Dresden, vol. 16, No. 2, 1924, p. 38 (Tsalia, Szechwan).

Four males and three females, Likiang Mountains, 8,500–12,000 feet, April, June, and August; one male, Likiang Plain, 8,200 feet, August 22; one male, Hofuping Mountains, November.



The above series averages considerably darker below than a small series of *Dryobates major cabanisi* from Shensi and Hupeh. A male from Fukien is slightly lighter than a male from Hupeh; Shanghai specimens average even lighter. La Touche<sup>18</sup> also, has noticed the darker Yunnan bird.

58. *DRYOBATES DARJELLENSIS* (Blyth)

*Picus (Dendrocopos) darjellensis* BLYTH, Journ. Asiatic Soc. Bengal, vol. 14, 1845, p. 196 (Darjeeling).

One female, between Lachiming and Lanping, 9,000 feet, June 2; and one male, mountains above Hungfuping, Mekong Valley, November.

The above male only differs from the female in having the sides of the neck orange instead of yellow, in darker underparts, and the yellow wash on the breast and belly more pronounced; possibly it is only a bird of the year that has not yet acquired the red occipital band.

59. *HYPOPICUS HYPERYTHRUS SUBRUFINUS* (Cabanis and Heine)

*Xylurgus subrufinus* CABANIS and HEINE, Mus. Heine, pt. 4, Heft 2, 1863, p. 50 (N. China; Talien Bay and Tientsin).

One immature male and three adult females, Likiang Mountains, July.

The immature male is a light buffy brown below barred with black; a mere tinge of red on the crown and under tail coverts.

The females compared with an equal number from north China are considerably darker below.

60. *PICOIDES FUNEBRIS* Verreaux

*Picoides funebris* VERREAUX, Nouv. Arch. Mus. Paris, vol. 6, Bull., 1870, p. 33 (Mountains of Chinese Tibet).

One male, Tseh Chung Mountains, November, and one male, Hofuping Mountains, November.

This is a very distinct species.

61. *YUNGIPICUS SCINTILLICEPS OMISSUS* (Rothschild)

*Dryobates pygmaeus omissus* ROTHSCILD, Bull. Brit. Orn. Club, vol. 43, 1922, p. 10 (Lichiang Range).

One female, between Dyinaloko and Baiwua, May 1; one male between Tuinakou and Likiang, 9,000 feet, May 18; one male, Likiang Mountains, August; one male, forests of Mili, southwest Szechwan, February.

These are more heavily streaked below than *Yungipicus s. scintilliceps*.

<sup>18</sup> Ibis, 1924, p. 285.

62. *THRIPONAX FORRESTI* (Rothschild)

*Dryocopus forresti* ROTHSCHILD, Bull. Brit. Orn. Club, vol. 43, 1922, p. 9  
(Mekong Valley, Yunnan).

One adult male, Likiang Mountains, July.

63. *JYNX TORQUILLA JAPONICA* Bonaparte

*Yunx japonica* BONAPARTE, Consp. Gen. Av., vol. 1, 1850, p. 112 (Japan).

One female, Likiang Mountains, 11,000 feet, May 9; one unsexed,  
Likiang Plain, 9,000 feet, April 14.

## Family HIRUNDINIDAE. Swallows

64. *HIRUNDO RUSTICA GUTTURALIS* (Scopoli)

*Hirundo gutturalis* SCOPOLI, Del. Flor. et Faun. Insubr., vol. 2, 1786, p. 96  
(Panay, Philippines).

Three immatures, Ashi, banks of the Yangtze, July.

65. *PTYONOPROGNE RUPESTRIS* (Scopoli)

*Hirundo rupestris* SCOPOLI, Annus I. Histor.-Nat., 1769, p. 167 (Tirol).

One male and one female, near Yangtza, Mekong Valley, November.

## Family MUSCICAPIDAE. Flycatchers

66. *HEMICHELIDON SIBIRICA ROTHSCHILDI* Baker

*Hemichelidon sibirica rothschildi* BAKER, Bull. Brit. Orn. Club, vol. 43,  
1923, p. 156 (Lichiang Range, N. W. Yunnan).

One male and four females, Likiang Mountains, 10,000 feet, June,  
July, and September.

A well-marked smaller and darker race of *H. sibirica*.

67. *ARIZELOMYIA LATIROSTRIS* (Raffles)

*Muscicapa latirostris* RAFFLES, Trans. Linn. Soc. Lond., vol. 13, 1821, p. 312  
(Sumatra).

Two adult females and one unsexed, Likiang Plain, 8,200 feet,  
August.

68. *SIPHIA PARVA ALBICILLA* (Pallas)

*Muscicapa albicilla* PALLAS, Zoogr. Ross.-Asiat., vol. 1, 1827, p. 462  
(Dauria).

Three males and three females, Likiang Mountains, 9,500–12,000  
feet, September.

69. *SIPHIA STROPHIATA* Hodgson

*Siphia strophciata* HODGSON, Indian Review, vol. 1, 1837, p. 651 (Nepal).

A fair series from various stations in the Likiang Mountains,  
11,000–12,000 feet, April, June, and July; one male, Yangtze Gorge,  
near Yulo, 7,400 feet, May.

A male from the Taipeishan district, Shensi, April 21, in the United States National Museum (237709) has the white frontal band much wider than any in the Yunnan series, but whether this is individual or not it is impossible to say. One male and two females from the Langbian Peaks, South Annam, taken in mid-April, certainly represent a distinct form. They are more of a russet brown above; the throat is slate gray, not blackish (in the male); and the white frontal band is reduced to almost the vanishing point. This form has been named *Siphia strophciata fuscogularis* Baker.<sup>14</sup>

70. *DIGENEA TRICOLOR CERVINIVENTRIS* Sharpe

*Digenea cerviniventris* SHARPE, Cat. Birds Brit. Mus., vol. 4, 1879, p. 460 (Manipur Hills).

Four males and two females from various stations in the Likiang Mountains, 12,000 feet, April 27, June, July, and September.

One of the above females has a broken bill, which caused me to overlook its position and send it to Outram Bangs for identification. He writes that the single female in the Museum of Comparative Zoology from Washan Mountain, Szechwan, has rusty spots at the ends of the greater wing coverts, while in the one sent him they are plain. This is a sign of immaturity. The above two females are not alike. One is lighter above, has rusty spots at the ends of the greater wing coverts, and the tail lighter and more uniformly colored than the other. It is probably not fully adult.

71. *NILTAVA SUNDARA DENOTATA* Bangs and Phillips

*Niltava sundara denotata* BANGS and PHILLIPS, Bull. Mus. Comp. Zool., vol. 58, no. 6, 1914, p. 280 (Mengtsze, Yunnan).

A good series of adults and immature from various stations in the Likiang Mountains, 9,500–12,500 feet, April–August.

The series of males shows quite a little variation, the mantle varying from a shining indulin blue to blackish violet-gray with little blue sheen and the lower parts from mars yellow to a much lighter hue.

The only typical specimen of *sundara* available for comparison is like the indulin-backed Yunnan male, but I prefer to follow Bangs<sup>15</sup> for the present.

There are two immature males, taken in July and August, respectively. The August specimen much duskier than the other and evidently younger. Both have acquired the blue tail and wings of the adult, however.

<sup>14</sup> Bull. Brit. Orn. Club, vol. 43, 1923, p. 11.

<sup>15</sup> Bull. Amer. Mus. Nat. Hist., vol. 44, 1921, p. 582.

72. *POLIOMYIAS HODGSONI* (Verreaux)

*Siphia hodgsonii* VERREAUX, Nouv. Arch. Mus. Paris, vol. 6, Bull., 1870, p. 34 (Mupin).

One male, Likiang Plain, May 7; four males, three females, and one immature, Likiang Mountains, 12,000–13,000 feet, June–August.

The immature is still in the spotted plumage, though nearly full grown. It was taken in August.

73. *MUSCICAPULA SUPERCILIARIS ASTIGMA* (Hodgson)

*Muscicapa astigma* HODGSON, in Gray's Zool. Misc., 1844, p. 84 (Nepal).

Three males and two females, Likiang Mountains, 10,000 feet, June and July.

A well-marked form; larger and lacking the white post-superciliary of *M. s. superciliaris*. The female is also quite different; much grayer above and on sides of neck.

74. *CHELIDORYNX HYPOXANTHA* (Blyth)

*Rhipidura hypoxantha* BLYTH, Journ. Asiatic Soc. Bengal, vol. 12, 1843, p. 935 (Darjeeling).

Two males, Likiang Mountains, 9,600 feet, April 20 and July.

75. *RHIPIDURA ALBICOLLIS*, subspecies?

*Platyrrhynchus albicollis* VIEILLLOT, Nouv. Dict. d'Hist. Nat., vol. 27, 1918, p. 13 (Bengal).

One adult unsexed, Likiang Mountains, 10,000 feet, May 26; one female, Whei Hsi, Mekong Divide, October; one male, Yetche, Mekong River, November.

I have only two birds from India and two from South Annam for comparison. The Indian birds are browner above than those from South Annam and the Yunnan specimens are grayer, with darker heads and tails and smaller bills than the latter. The Yunnan bird is quite distinct from that of India (one of the specimens is from Tenasserim), but for the present I prefer to leave it unnamed.

76. *CULICICAPA CEYLONENSIS ORIENTALIS* Baker

*Culicicapa ceylonensis orientalis* BAKER, Bull. Brit. Orn. Club, vol. 44, 1923, p. 11 (Szechwan).

One unsexed adult, Likiang Mountains, 11,000–12,000 feet, April 12.

77. *EUMYIAS THALASSINA THALASSINA* (Swainson)

*Muscicapa thalassina* SWAINSON, Nat. Hist. Flycatchers, 1838, p. 252 (India).

Four males and three females, Likiang Mountains, 8,500–12,000 feet, May, July, and August; one male, between Ganhaitze and

Yangtze Gorge, 9,000 feet, May 20; two males and one female, Likiang Plain, 8,200 feet, August 22-23.

A male and female from the last locality are immature, changing from the spotted plumage to that of the adult, and the change has been practically completed except for the throat and chest.

### Family CAMPEPHAGIDAE. Caterpillar Shrikes

#### 78. *GRAUCALUS MACEI SIAMENSIS* Baker

*Graucalus macei siamensis* BAKER, Bull. Brit. Orn. Club, vol. 38, 1918, p. 69 (Mi-Nam-Kabren, Siam).

One adult male, marked female, Limestone range east of the Likiang Mountains, 10,000 feet, July.

Wing measures 185 mm.

#### 79. *CAMPEPHAGA MELASCHISTA AVENSIS* Blyth

*Campephaga avensis* BLYTH, Cat. Birds Asiatic Soc., 1847, p. 327 (Arakan).

One adult female, Taitzutung, east slope of Likiang Mountains, July.

This is a much darker bird, both above and below, than a male and two females from Anhwei and Hunan Provinces, but Stuart Baker,<sup>16</sup> with a series of 200 specimens, says that dark birds occur along with light ones and are not confined to particular areas.

#### 80. *PERICROCOTUS BREVIROSTRIS AFFINIS* McClelland

*Pericrocotus affinis* MCCLELLAND, Proc. Zool. Soc. Lond., 1839, p. 156 (Assam).

One male and one female, Tengyueh (Paofungssu), 5,600 feet, March 5; one male, between Pakang and Wamangai, March 16; one male, between Feilung Chiao and Yünlung, March 21.

The female is considerably darker above than the same sex of *P. b. ethologus*, the forehead yellowish instead of whitish, and the lower parts a deeper yellow.

The males can not be told with certainty from *P. b. ethologus*, except they seem to have considerably shorter tails.

#### 81. *PERICROCOTUS BREVIROSTRIS ETHOLOGUS* Bangs and Phillips

*Pericrocotus brevirostris ethologus* BANGS and PHILLIPS, Bull. Mus. Comp. Zool., vol. 58, 1914, p. 282 (Hsienshan, Hupeh).

A good series from: Likiang Mountains, 8,500-12,000 feet, April-August; Likiang Plain, 8,200-9,400 feet, May and August; Likiang Forests, August.

<sup>16</sup> Faun. Brit. India, Birds, ed. 2., vol. 2, 1924, p. 338.

The males of this series differ principally from the series I have called *P. b. affinis* from the Burma border in having longer tails and the lower parts scarlet instead of scarlet red. The only female of *P. b. affinis* available is quite different from the same sex of *P. b. ethologus*. It is much darker above without the olive wash to the lower back, the forehead yellowish, and the rump and lower parts a much deeper yellow.

A male in the Museum from Shensi has a shorter tail than the Likiang males and the red below is not quite so scarlet.

*Pericrocotus brevirostris styani* Baker<sup>17</sup> is apparently only a synonym of Bangs and Phillips' form, as he evidently overlooked their paper.

An immature female, taken in the Likiang Mountains in August, has the feathers of the head and mantle barred with blackish and narrowly tipped with white, the throat and chest barred with dusky. A female taken at the same time and place is much lighter above than the adult and below has the plumage much mixed with grayish-white. It is an immature in the next stage after losing the dusky and white bars above and the dusky bars below.

### Family PYCNONOTIDAE. Bulbuls

#### 82. MICROSCELIS LEUCOCEPHALUS (Gmelin)

*Turdus leucocephalus* GMELIN, Sys. Nat., vol. 1, pt. 2, 1789, p. 829 (China).

A fair series of both sexes and immature: Likiang Mountains, 8,200–10,000 feet, April–August; Likiang Plain, 8,200 feet, August; Ashi, banks of the Yangtze, July; Lameka, north of Lashipa, July; Tseh Chung Mountains, Mekong Valley, November.

The United States National Museum has acquired quite a series of this species in recent years from the various parts of its range. Amongst this series there are specimens wholly black; black with a white head; black with a gray breast and white head; and specimens changing from one plumage to another. I rather think the wholly black bird is a younger stage of plumage, as one specimen of this phase (296540) has a dark upper mandible; the black birds with white heads the next stage; and the black-backed, gray-breasted, white-headed birds the fully adult of the second or third year. Yet there is a specimen (296539), black-backed and gray-breasted changing from a dark colored head to a white one, which would tend to show that this plumage is sometimes acquired at the first molt. It seems to me that *Haringtonia leucocephalus montivagus* Bangs and Penard<sup>18</sup> represents only the black phase of the present species.

<sup>17</sup> Bull. Brit. Orn. Club, vol. 40, 1920, p. 117.

<sup>18</sup> Proc. New England Zool. Club, vol. 8, 1923, p. 41.

83. *MICROSCELIS PSAROIDES CONCOLOR* (Blyth)

*Hypsipetes concolor* BLYTH, Journ. Asiatic Soc. Bengal, vol. 18, 1850, p. 816 (Tenasserim).

Two adults (unsexed), between Hsia-yang-tsun and Chienchuan (pine forest), March 30; one male, pine forest northwest of Shayangching, 8,900 feet, May 30; one male and one female, Forest of Ngaza, west of Likiang Mountains, 8,600 feet, June; one male between Lochming and Lamping, 9,000 feet, June; one immature female, Hofuping Mountains, Mekong Valley, November.

The above series has been compared with two males and two females from south Annam, collected by Kloss. The Annam birds are clearer, darker gray below, but the Yunnan series is more worn and faded and hardly comparable.

The immature listed above may or may not be this species. It is black, almost glossless; the throat and foreneck lightly frosted with white; breast, belly, and under tail coverts white, streaked with black; middle wing coverts narrowly tipped with yellowish white; under wing coverts and a narrow border on the inner webs of the remiges white; upper tail coverts white stippled rather heavily with black. The bill (in the dried skin), blackish above, brownish (below).

This is entirely distinct from the black phase of *Microscelis leucocephalus*, to which the present species is very closely related. If not the immature plumage of *Microscelis p. concolor* (of which I have seen no description), I do not know where to place it.

84. *MOLPASTES HAEMORRHOUS NIGRIPILEUS* (Blyth)

*Pycnonotus nigripileus* BLYTH, Journ. Asiatic Soc. Bengal, vol. 16, 1847, p. 472 (Tenasserim).

One male between Chugai and Kantingai, 6,000 feet, Salween Valley, March 14.

This specimen has the black of the throat very restricted, not even extending onto the foreneck. It has apparently not been reported from Yunnan before.

85. *PYCNONOTUS AURIGASTER XANTHORHUS* Anderson

*Pycnonotus xanthorhous* ANDERSON, Proc. Asiatic Soc. Bengal, 1869, p. 265 (Manwyne, Yunnan).

One, Huigai, March 11; one male, between Kantingai and Musanlin, Salween Valley, March 15; one male, Wamangai and Tsao Chiang, March 17; one male, Feilung Chiao, Mekong Valley, March 20; one female, Yünlung, March 22; one male and one female, Nguluko, 9,400 feet, Likiang Mountains, April 5.

86. *OTOCOMPSA EMERIA EMERIA* (Linnaeus)

*Lanius emeria* LINNAEUS, Syst. Nat., ed. 12, 1766, p. 137 (Bengal).

One male, between Chugai and Kantingai, 6,000 feet, Salween Valley, March 14; one male, between Kantingai and Musanglai, Salween Valley, March 15.

87. *SPIZIXOS CANIFRONS* Blyth

*Spizixos canifrons* BLYTH, Journ. Asiatic Soc. Bengal, vol. 14, 1845, p. 571 (Cherra Punji).

A good series of both sexes from between Chungai and Kantingai, Salween Valley, 6,000 feet, March; between Yünlung and Tanten, March; between Likiang and Tuinakou, 10,000 feet, May; Mount Mitzuza, 12,000 feet, forest of Mili, southwest Szechwan, February.

## Family TIMALIIDAE. Babbling Thrushes

88. *BABAX LANCEOLATA BONVALOTI* Oustalet

*Babax lanceolatus*, var. *bonvaloti* OUSTALET, Ann. Sci. Nat., ser. 7, vol. 7, 1892, pp. 273, 274 (So. Tibet, error!); Nouv. Arch. Mus. Paris, ser. 3, vol. 5, p. 192 (Tara, Tibet).

A small series of adults and young from between Yünlung and Tanten, March; Lashipa Plain, 8,600 feet, June; Likiang Mountains, 11,000–12,000 feet, April–September.

The series averages larger and darker than the single male of *Babax l. lanceolata* from Hupeh with which it has been compared.

The immature only differs from the adult in having the brown stripes above and on the flanks reduced in size and depth of color; in fact, the stripes on the flanks are almost absent.

89. *TROCHALOPTERON ELLIOTII ELLIOTII* Verreaux

*Trochalopteron elliotii* VERREAUX, Nouv. Arch. Mus. Paris, vol. 6, Bull. 1870, p. 36 (Mountains of Chinese Tibet).

A good series of adults from: Mountains near Yangtza, Mekong Valley, November; mountains above Hungfuping, November; Hofuping Mountains, Mekong Valley, November; Tseh Chung Mountains, Mekong Valley, November; forests of Mili, southwest Szechwan, February.

The above series agrees quite well with a small number of specimens from Szechwan (Mount Omei). Specimens in the United States National Museum from Shensi and Hupeh Provinces are considerably lighter, but not quite as light as the series I have identified as *T. e. yunnanense*.



90. *TROCHALOPTERON ELLIOTI* YUNNANENSE Rippon

*Trochalopecteron yunnanense* RIPPON, Bull. Brit. Orn. Club, vol. 19, 1906, p. 32 (Yangtze River, W. Yunnan).

A good series of adults and immatures from Nguluko, 9,000 feet, April; Likiang Plain, 9,000 feet, April 14; Likiang Mountains, 10,000-15,000 feet, April-September; between Likiang and Gan-haitze, 10,000 feet, May; Bayiwua, 10,000 feet, May; between Dyinaloko and Bayiwua, May; Lameko Mountain, north of Lashipa, July.

The above series is considerably lighter below than what I take to be *T. e. ellioti*, and lacks to a great extent the white edging to the feathers of the throat and chest, and the central tail feathers are gray with little or no yellow as a rule.

My disposition of this form does not agree with the original diagnosis; it may be Rippon's description really applies to the preceding race. Anyway the form is not well marked and the distribution as worked out above hard to understand, unless this is a form confined to the high mountains and the form found in the Mekong watershed and the western border is unnamed, but for the present I prefer to leave the matter in abeyance, as the differences may be seasonable.

Young about half grown in the series, taken in July, resemble the adult, except the throats, pileum, and ear coverts are darker, the central tail feathers orange-citrine, and the malar stripe is buffy. Two immature specimens of adult size taken in August and September still retain these characters, but not in so pronounced a form.

91. *TROCHALOPTERON AFFINIS OUSTALETI* (Hartert)

*Ianthocinela affinis oustaleti* HARTEBT, Vögel paläarkt. Fauna, vol. 1, Heft 5, 1909, p. 633 (Tsékou, Yunnan).

A fine series from Likiang Mountains, 12,000 feet, April-August; Wheihsi, Mekong Valley, October; Mountains near Yangtza, Mekong Valley, November; Hofuping Mountains, Mekong Valley, November; forest of Youngning, February; forests of Mili, S. W. Szechwan, February.

Specimens with the top of the head brownish instead of black are mostly marked as females by the collector, so I imagine this is a sexual or age character.

I have only one specimen of *T. a. blythi*, a male from near Kiating, Szechwan, for comparison. It is considerably smaller than males in the above series and lacks the gray patch on the sides of the neck, otherwise it is very similar in color.

92. *TROCHALOPTERON STYANI* Oustalet

*Trochalopteron styani* OUSTALET, Bull. Mus. Paris, vol. 4, 1898, p. 226  
(Ta-tsien-lou, Szechwan).

One male, mountains near Yangtza, Mekong Valley, November; two females, Hofuping Mountains, Mekong Valley, November; one male and one female, Tseh Chung, Mekong Valley, November.

These specimens are so very different from the plate of *Trochalopteron cinereiceps* Styan<sup>19</sup> that it seems to me that to sink *styani* to only a race of that species is to more or less obscure these fundamental differences. The differences have already been pointed out by Hartert.<sup>20</sup>

93. *IANTHOCINCLA MAXIMA* (Verreaux)

*Pterorhinus maximus* VERREAUX, Nouv. Arch. Mus. Paris, vol. 6, Bull. 1870, p. 36, pl. 3, fig. 1 (Mountains of Chinese Tibet).

A good series of both sexes from Likiang Mountains, 10,000–12,000 feet, April to August; Litiping Mountains, Mekong-Yangtze Divide, October; Hofuping Mountains, Mekong Valley, November; Mount Dyinaloko, 11,500–12,000 feet, April and June; Mountains near Yangtza, Mekong Valley, November; forest of Mili, S. W. Szechwan, February.

Some specimens have the feathers of the throat and chest with subterminal black bars, while in others these bars are only faintly indicated on the sides of the chest. The upper back has the terminal spots buffy or white, with the latter predominating in the series. Winter specimens are darker below than those taken in summer.

94. *IANTHOCINCLA BIETI* Oustalet

*Ianthocincla bieti* OUSTALET, Bull. Mus. Paris, vol. 3, 1897, p. 163 (Tatsien-lou, Szechwan).

Five males and three females from Hofuping Mountains, Mekong Valley, November; and Litiping Mountains, Yangtze-Mekong Divide, 12,000 feet, November.

Rothschild<sup>21</sup> in commenting upon specimens from the same general region says that they differ somewhat from the original description but does not mention in what particular. Below a description is given for future comparison:

Above antique brown, becoming sudan brown on the pileum; each feather above from the nape to the tail with a subterminal black bar and white tip; lores, region around the eye, and upper and posterior border of ear coverts white; a narrow line of blackish bordering the white on the lores and above the eye and meeting a post-ocular black-

<sup>19</sup> Ibis, 1887, pl. 6.

<sup>20</sup> Vögel paläarkt. Fauna, vol. 1, Helt 5, 1909, p. 630.

<sup>21</sup> Nov. Zool., vol. 30, 1923, p. 44.

ish line posteriorly; throat, chest, and lower ear-coverts fuscous or blackish, the feathers of the chest tipped with white; breast smoke gray, the feathers tipped with white; belly white; sides, flanks, and under tail-coverts like the back or a little lighter, the feathers with a narrow subterminal black bar and white tip; sides of neck the color of the back with small white spots; wing coverts like the back and with similar spots; alula dark gull gray with a small white tip to the feathers; primary coverts black tipped with white; six outer primaries, deep gull gray on the inner and outer web, black along the shaft, part of the inner web, and subterminally, the tip white; the seventh primary becoming brown basally on the outer and this color increasing inwardly until the secondaries become wholly brown on the outer web, black on the inner and subterminally, tipped with white; the tertials wholly brown with a subterminal black bar and white tip; middle tail feathers like the back in color with a subterminal black bar and narrow white tips; outer tail-feather deep gull gray, with a broad subterminal black bar and white tip; the second outer tail feather becoming brown basally and this color increasing inwardly until the middle feathers are reached; all the tail feathers have the black subterminal bar and white tip, but considerably reduced on the middle pair.

*Remarks.*—In some specimens the chest is the color of the back with a narrow black subterminal black bar and white tip; in fact, the birds with the chest fuscous or blackish with white tips to the feathers seem to be the rarer of the two.

The series measures as follows: Five males, wing, 109–120 (112.7); tail, 135–140 (138); culmen, 26–28 (26.8); and three females, wing, 109–112 (110.3); tail, 133–139.5 (136.5); culmen, 25.5–27 (26.2).

95. *POMATORHINUS RUFICOLLIS BAKERI* Harington

*Pomatorhinus ruficollis bakeri* HARRINGTON, Journ. Bombay Nat. Hist. Soc., vol. 23, 1914, p. 336 (Shillong).

Three males and eight females from: Tengyueh, 5,300 feet, March 7; Likiang Mountains, June and August; Ngaza, east of Likiang Mountains, June; Hofuping Mountains, Mekong Valley, November.

This series is quite uniform in color and averages larger and lighter than a series from Suifu, Szechwan (*Pomatorhinus ruficollis styani*). One male and two females from Fukien and Hunan are slightly smaller and much darker than Szechwan specimens and represent *Pomatorhinus ruficollis stridulus*. From the evidence at hand there are at least three recognizable mainland races of this species in China, namely: *Pomatorhinus ruficollis bakeri* Harington (Assam to western Yunnan), *Pomatorhinus ruficollis stridulus* Swinhoe (southeast China), and *Pomatorhinus ruficollis styani* Seeböhm (Yangtze Valley).

Three additional races have been named from southeast Yunnan, namely: *Pomatorhinus ruficollis reconditus* Bangs and Phillips;<sup>22</sup> *Pomatorhinus ruficollis laurentei* La Touche;<sup>23</sup> and *Pomatorhinus ruficollis albipectus* La Touche.<sup>24</sup> The United States National Museum contains no material from this region and so I am not able to judge of the validity of the forms, but if they should prove to be synonymous with *P. r. bakeri*, then Bangs and Phillips's name should be used for it.

96. *POMATORHINUS ERYTHROGENYS DEDEKENSII* (Oustalet)

*Pomatorhinus macclellandi*, var. *dedekensi* OUSTALET, Ann. Sci. Nat. Zool., ser. 7, vol. 12, 1892, pp., 276, 304 (Tibet and Tatsienlou).

A fine series of adults and immatures from: Yünglung, March; Likiang Plain, 9,000 feet, April and August; Likiang Mountains, 10,000 feet, April–August; Limestone Range, 10,000 feet, east of the Likiang Mountains, July; Hofuping Mountains, Mekong Valley, November; Mountains near Yangtza, Mekong Valley, November; Forests of Youngning, northwest Yunnan Plain, February.

There is considerable variation in this series. Early spring and fall taken examples are much darker above, the sides and flanks deeper, and the spotting below heavier than birds taken in the summer when wear and fading sets in. There is considerable individual variation, however, especially in the amount of spotting below.

I have only a pair of birds from Shensi (*P. e. gravivox*) for comparison, the female smaller and darker than the male. These two specimens average considerably lighter than birds in corresponding plumage in the Yunnan series. It seems to me that *Pomatorhinus macclellandi odicus* Bangs and Phillips<sup>25</sup> is only a synonym of Oustalet's bird.

97. *DRYONASTES SANNIO ALBOSUPERCILIARIS* (Godwin-Austen)

*Garrular albosuperciliaris* GODWIN-AUSTEN, Proc. Zool. Soc., 1874, p. 45 (Munipur Valley, near Kaibi).

A good series from: Near Feilung Chiao, Mekong Valley, March 20; between Tan Ten and Ssuching, March 24; Nguluko, 10,000 feet, April 7; Likiang Mountains, 8,000–10,000 feet, June–August; Likiang-Lashipa Plain, 8,600 feet, May; Forests of Chingai, 6,000 feet, Salween Valley, May 14; Likiang Plain, 8,200 feet, August; Tseh Chung, Mekong Valley, November; Hofuping Mountains, Mekong Valley, November.

This series bears out the characters pointed out by Bangs<sup>26</sup> when compared with birds from central and southeast China.

<sup>22</sup> Bull. Mus. Comp. Zool., vol. 58, no. 6, April, 1914, p. 286 (Mengtze, Yunnan).

<sup>23</sup> Bull. Brit. Orn. Club, vol. 42, 1921, p. 16 (Kopaotsun, S. E. Yunnan).

<sup>24</sup> Idem, vol. 43, 1923, p. 173 (Szemao, S. Yunnan).

<sup>25</sup> Bull. Mus. Comp. Zool., vol. 58, 1914, p. 286.

<sup>26</sup> Bull. Amer. Mus. Nat. Hist., vol. 20, 1921, p. 588.

98. *ALCIPPORNIS NIPALENSIS YUNNANENSIS* (Harington)

*Alcippe fratercula yunnanensis* HARRINGTON, Bull. Brit. Orn. Club, vol. 33, 1913, p. 63 (Gyi-dzin-shan, east of Talifu, Yunnan).

One female, Tengyueh, Paofungssu, 5,600 feet, March 5; one male, Yangtza Mountains, Mekong Valley, November.

These two specimens when compared with *A. n. nipalensis* are quite distinct. They are more of a buffy brown on the back without a reddish cast; the tail not very distinctly different from the back; the pileum and hind neck a purer gray; the lower parts more extensively and a deeper cinnamon-buff with little or no white. *A. n. hueti* is sort of intermediate in color between *A. n. nipalensis* and *A. n. yunnanensis*, but nearer the former from which it is quite distinct, however. It is a clearer gray on the pileum, more buffy below, and somewhat larger than *A. n. nipalensis*.

99. *FULVETTA RUFICAPILLA SORDIDIOR* (Rippon)

*Proparus sordidior* RIPPON, Bull. Brit. Orn. Club, vol. 13, 1903, p. 60 (Talifu, Yunnan).

One female between Tuinakou and Likiang, 9,000 feet, May 18; one female, Likiang Plain, 8,200 feet, August 21; one female, Hofuping Mountains, November.

100. *FULVETTA VINIPECTA BIETI* (Oustalet)

*Alcippe (Proparus) bieti* OUSTALET, Ann. Sci. Nat., ser. 7, vol. 12, 1892, p. 284, pl. 9, fig. 2 (Ta-tsien-lou).

A series of adult males and females: Likiang Mountains, 12,000–14,000 feet; April–July; between Bayiwua and Heshwe, 10,000 feet, May 2; between Likiang and Ganhaitze, 10,000 feet, May 19; Yangtza Mountains, Mekong-Salwin Divide, November; Hofuping Mountains, Mekong Valley, November; Forests of Youngning, February.

This series agrees essentially with a specimen from near Tatsienlu, the type locality, but differs from *vinipecta* so widely in the color of the crown, ear coverts, and other particulars that it is very doubtful whether they are forms of a single species. The differences are best given in parallel columns:

*F. vinipecta*

Crown and nape, snuff brown.  
Ear coverts, color of the crown.  
Upper back, only lighter than the crown.  
Lower back and rump, ochraceous tawny.  
General effect of the tail above, tawny olive.  
Belly and crissum, cinnamon-buff.

*F. bieti*

Crown and nape, buffy brown.  
Ear coverts, dull black.  
Upper back, light grayish-olive.  
Lower back and rump, clay color.  
General effect of the tail above, drab.  
Belly and crissum of the same color as the chest.

101. *MOUPINIA POECILOTIS SORDIDIOR* Rothschild

*Moupinia poecilotis sordidior* ROTHSCHILD, Nov. Zool., vol. 28, 1921, p. 36  
(Likiang Range, Yunnan).

One male, four females, and one unsexed, Likiang Mountains, 11,000–12,000 feet, April, July, and August; one female between Likiang and Ganhaitze, 10,000 feet, May 19; one male, Hofuping Mountains, Mekong Valley, November.

This genus being unrepresented in the United States National Museum before, one of the specimens was forwarded to the Museum of Comparative Zoology to have Outram Bangs verify the identification. He writes: "The form does not seem to me as strongly marked as one might infer from the description. In our series from Tatsienlu, many are redder, but some almost match the skin sent."

Since the above series was received the Rev. David C. Graham has forwarded two poor skins taken at Sungpan and Wenchwan, northern Szechwan, localities considerably north of the type locality (Mupin). These seem to be a clearer white on the throat and chest than the Yunnan series and the superciliaries are whitish and the ear coverts reddish, not gray; above there seems to be little or no differences.

Eventually it will probably be necessary to remove this genus from the Timaliidae and place it in the Sylviidae. In external characters, at least, it is not far removed from *Suya* or *Prinia*.

102. *SCHOENIPARUS DUBIUS GENESTIERI* (Oustalet)

*Alcippe genestieri* OUSTALET, Bull. Mus. d'Hist. Nat. Paris, vol. 3, 1897, p. 210 (Tsekou).

Three males and three females, Likiang Mountains, 8,200–8,500 feet, June and August.

103. *SCHOENIPARUS DUBIUS INTERMEDIUS* Rippon

*Schoeniparus intermedius* RIPPON, Bull. Brit. Orn. Club, vol. 11, 1900, p. 11  
(Bhamo, Burma).

Two males and one female, Tseh Chung, Mekong Valley, November; two males, mountains near Yangtza, Mekong Valley, November; one male, Hofuping Mountains, Mekong Valley, November.

This series is quite distinct from the series I have identified as *S. d. genestieri*, and it is doubtful to my mind whether it would not be better to consider them distinct species. They are darker, more olive, not so rusty above and on the flanks; the black line above the superciliary is broader; the loreal streak is pronounced and blackish; the ear coverts much darker. Two or three of the specimens have the sides of the throat with a few rather obscure spots, but this seems to be entirely lacking in two of the males; it is probably only an

age character. As a matter of fact, the series more closely resembles a specimen of *S. d. mandellii* from Assam than it does *S. d. genestieri*. It is not quite so buffy on the throat and jugulum; the sides of neck are unstreaked, or nearly so; the bill is smaller; the back and tail are darker, more olive without so much of a reddish cast.

104. *STACHYRIDOPSIS RUFICEPS BHAMOENSIS* Harington

*Stachyridopsis ruficeps bhamoensis* HARRINGTON, Ann. and Mag. Nat. Hist., ser. 8, vol. 2, 1908, p. 245 (Bhamo, Burma).

One male, Linchia, March 12.

With only one specimen of *S. r. ruficeps* from Annam—possibly not the same as the Indian bird—it is hard to say exactly how they differ. The Annam bird is considerably smaller than the present specimen, more grayish on the back, and much lighter below. *Stachyridopsis praecognitus* (Swinhoe) is only a form of *S. r. ruficeps* with a somewhat smaller bill, more restricted crown patch, the back citrine not grayish or brownish, the lower parts more yellowish.

105. *HETEROXENICUS SINENSIS* (Rickett and La Touche)

*Brachypteryx sinensis* RICKETT and LA TOUCHE, Bull. Brit. Orn. Club, vol. 6, 1897, p. 1 (Kuatun, N. W. Fokien).

Five adult males, two immature males, and three females, Likiang Mountains, 10,000–12,000 feet, June–July.

The adult males in this series are much darker below than two males in the National Museum from Sikkim (*Heteroxenicus cru-ralis*), especially on the breast and belly. In the Sikkim specimens the breast and belly are neutral gray, sparingly streaked and tinged with indigo, giving a bluish-gray cast. In certain particulars the Likiang specimens do not agree with Stuart Baker's<sup>27</sup> description.

The concealed part of the wings and tail are not "dark brown" but blackish or in the case of the tail, bluish. It may well be that they do not belong to the present species at all, but they agree better with it than they do with any other form attributed to China.

A specimen (296614) marked as a male is exactly like the adult female, except it has a silky-white superciliary. A still younger bird of the same sex in spotted plumage lacks the white superciliary.

A female taken in June (297038) is lighter on the back, the forehead, and lores, and has a slightly smaller bill than the others in the series and may not belong to this species at all, but I do not know at present where else to place it.

<sup>27</sup> Fauna Brit. India, Birds, ed. 2, vol. 2, 1924, p. 20.

106. *LIOPTILA DESGODINSI* (David and Oustalet)

*Sibia desgodinsi* DAVID and OUSTALET, Bull. Soc. Philom. Paris, ser. 7, vol. 1, 1877, p. 139 (Yer-ka-lo).

A fine series from: Heshwe, 10,000 feet, April 30; between Bayiwua and Heshwe, 10,000 feet, May 2; Likiang Mountains, 8,500–14,000 feet, April–August; Ngaza, east of Dyinaloko Mountain, 9,000 feet, June; Hofuping Mountains, Mekong Valley, November; Tseh Chung Mountains, Mekong Valley, November; Youngning Forests, February; Yunnan-Szechwan border, February.

The above series does not appear to differ from specimens from Szechwan. A young bird not long from the nest was taken in August. It does not differ from the adult, except in size.

107. *SIVA CYANOPTERA WINGATEI* Grant

*Siva wingatei* GRANT, Bull. Brit. Orn. Club, vol. 10, 1900, p. 38 (Yunnan City).

One female, Yünlung, March 22.

This specimen is considerably lighter brown above and much lighter below than any specimen in a series of five females from Suifu, Szechwan; it is also more streaked on the head.

108. *SIVA STRIGULA YUNNANENSIS* Rothschild

*Siva strigula yunnanensis* ROTHSCHILD, Nov. Zool., vol. 28, 1921, p. 40 (Likiang Range, Yunnan).

A fine series of both sexes from: Between Likiang and Tuinakou (Yangbei Road), 10,000 feet, May 16; between Likiang and Ganhaitze, 10,000 feet, May 19; Likiang Mountains, 10,000–13,000 feet, April–August; Lameko Mountain, north of Lashipa, July; Tseh Chung Mountains, Mekong Valley, October; Hofuping Mountains, Mekong Valley, November; Mountains near Yangtza, Mekong Valley, November; Mili Forest, southwest Szechwan, February.

The birds taken in the fall have the whole lower parts, even the throat, deep yellow, the back olive drab. In spring and summer taken examples the back becomes deep olive gray; the pileum much brighter and more restricted; the throat grayish white, only the chin remaining yellow; the foreneck grayish; and the yellow of the lower parts much lighter and more restricted. In both styles the throat is barred with black. There are also other slight differences. The two plumages are very distinct and the change must take place at a rather early date, as it has been already assumed by a specimen taken as early as April 21, in rather 'unworn' plumage; in the summer, when wear and fading have set in, the differences are still further accentuated.



## 109. YUHINA DIADEMATA Verreaux

*Yuhina diademata* VERREAUX, Nouv. Arch. Mus. Paris, vol. 5, Bull. 1869, p. 35 (Mupin).

A good series: High slopes of the Mekong Ridge above Tsao Chiang, March; Likiang Mountains, 9,400–14,000 feet, April–August; Hofuping Mountains, Mekong Valley, November; forests of Youngning, February.

Specimens in fresh unworn plumage are much darker than birds after they have begun to fade and wear. With only a few specimens from Szechwan (only one in good shape) for comparison, I follow Rothschild<sup>28</sup> in his disposition of *Yuhina ampelina* Rippon.

## 110. YUHINA GULARIS GRISEOTINCTA Rothschild

*Yuhina gularis griseotincta* ROTHSCHILD, Nov. Zool., vol. 28, 1921, p. 42 (Shweli-Salwin Divide, Yunnan).

One female, Tengyueh Paofungssu, 5,600 feet, March 5.

## 111. YUHINA OCCIPITALIS OBSCURIOR Rothschild

*Yuhina occipitalis obscurior* ROTHSCHILD, Nov. Zool., vol. 28, 1921, p. 42 (Likiang, Yunnan).

A good series: Cliffs of Mekong Valley, 11,000 feet, March 19; Lusuko (Mount Dyinaloko), 11,600 feet, April 27; Likiang Mountains, 11,000–12,000 feet, April–August.

## 112. LIOTHRIX LUTEUS YUNNANENSIS Rothschild

*Liothrix luteus yunnanensis* ROTHSCHILD, Nov. Zool., vol. 28, 1921, p. 36 (Shweli-Salwin Divide, Yunnan).

Two males, Hofuping Mountains, November; one male, mountains near Yangtza, November.

This is a very different race from *L. l. luteus* of Szechwan and Hupeh Provinces. It is larger and much deeper in color above; the back overlaid with a yellowish wash, not simply dark gray; the lores and sides of head lemon yellow, instead of grayish; the throat and jugulum deeper yellow; the breast, belly, and under tail coverts light yellow instead of grayish white; the color of the wing deeper. In fact it is so different that I have my doubts but what it should not be accorded specific rank, except that good specimens of *L. l. calipygus* are not available for comparison.

## 113. PTERUTHIUS AEROLATUS RICKETTI (Grant)

*Pteruthius ricketti* GRANT, Bull. Brit. Orn. Club, vol. 14, 1904, p. 92 (S. China).

One female, forest of Chungai, 6,000 feet, March 14; one male, Mekong Valley, 8,000 feet, March 19; one male and one female,

<sup>28</sup> Nov. Zool., vol. 30, 1923, p. 258.

Likiang Mountains, July; one male, Hofuping Mountains, Mekong Valley, November; one male, Tseh Chung Mountains, Mekong Valley, November.

114. *PTERUTHIUS XANTHOCHLORIS PALLIDUS* (David)

*Allotrius xanthochloris*, var. *pallidus* DAVID, Nouv. Arch. Mus. Paris, vol. 7, 1871, p. 14 (Frontiers of Kookonor).

One female, Muang-hü-ko, east slopes of Likiang Mountains, July; two males and one female, mountains near Yangtza, Mekong Valley, November.

Family TROGLODYTIDAE. Wrens

115. *NANNUS TROGLODYTES TALIFUENSIS* (Sharpe)

*Anothura talifuensis* SHARPE, Bull. Brit. Orn. Club, vol. 13, 1902, p. 11 (Gyi-dzin-shan, Yunnan).

Two females and one unsexed, Likiang Mountains, 11,000–12,500 feet, April 8–15; one female, mountains near Yangtza, Mekong Valley, November.

Three males from western Szechwan are slightly darker. A male from Ichang, Hupeh, is considerably lighter than any in the Yunnan series. The ranges of the various forms in China do not seem to be very satisfactorily worked out.

116. *SPELAEORNIS SOULIEI* Oustalet

*Spelaeornis souliei* OUSTALET, Bull. Mus. d'Hist. Nat., vol. 4, 1898, p. 257 (Tsekou).

One female, Hofuping Mountains, Mekong Valley, November.

This specimen does not agree with the figure of this species<sup>29</sup> or the description of the young.<sup>30</sup> As it is very close and the plumages or variations are so little known it would be unwise to provide it with a name at this time. The specimen may be described as follows:

Similar to Hartert's figure<sup>29</sup> cited above, but blackish terminal spots on head more pronounced; back much lighter (near sudan brown), the apical black spot more pronounced; auriculars sides of neck, flanks, and breast much lighter (ochraceous tawny), the black apical spot nearly obsolete; and the wing coverts narrowly barred with white, drab, and dusky.

It seems to be adult, but from the description of the young it may be a bird of the year not yet in fully adult plumage. It measures: Wing, 48; tail, 50; culmen, 10; tarsus, 20; middle toe, 13 mm.

<sup>29</sup> Nov. Zool., vol. 17, 1910, pl. 7, fig. 1.

<sup>30</sup> Idem, vol. 28, 1921, p. 25.

## 117. OLIGURA CASTANEOCORONATA CASTANEOCORONATA (Burton)

*Sylvia? castaneo-coronata* BURTON, Proc. Zool. Soc. Lond., 1835, p. 152 (Himalaya).

One male and three females, Likiang Mountains, June.

The only specimen available is a male from Sikkim. It is smaller, has a darker head, the back more of a warbler instead of olive-green, and the lower parts a deeper yellow when compared with the Yunnan series. Whether these differences would hold in a larger series is for the future to decide.

## Family CINCLIDAE. Dippers

## 118. CINCLUS CINCLUS CASHMERIENSIS Gould

*Cinclus cashmeriensis* GOULD, Proc. Zool. Soc. Lond., 1859, p. 494 (Kashmir).

One male, Likiang Mountains, 9,600 feet, April 18.

The above and a female from Sungpan, Szechwan, when compared with a series of three males and four females from Kashmir, are darker on the breast and belly and grayer on the back, with little or no brownish wash. They probably represent a distinct form, but which is better left unnamed for the present.

## 119. CINCLUS PALLASHI SOULIEI Oustalet

*Cinclus pallasi*, var. *souliei* OUSTALET, Ann. Soc. Nat. Zool., ser. 7, vol. 12, 1891 (1892), p. 299 (Tatsienlou and Mupin).

One female, Likiang Mountains, September; one female, Whei Hsi, October; one female, Hungfuping, Mekong Valley, November.

## Family TURDIDAE. Thrushes

## 120. MYOPHONUS TEMMINCKII EUGENEI Hume

*Myiophoneus eugenei* HUME, Stray Feathers, vol. 1, 1873, p. 475 (Pegu).

One male, between Pakang and Wamangai, March 16; one male, between Yünlung and Tan-ten, March 23; two adult males, one immature male, and two unsexed, Likiang Mountains, 10,000–11,000 feet, May–August.

Besides the differences pointed out by Stuart Baker<sup>21</sup> between this and *M. t. temminckii*, the above series has larger, heavier bills; darker above and below; the blue more of a dusky violet-blue instead of dark soft bluish-violet; and the rump and belly without any white bases to the feathers. In fact, they are so different that I have serious doubts of the propriety of making them forms of one species.

The young was taken in August and is like the parents, but duller without the glistening blue spots or shoulder patch. It is rather

<sup>21</sup> Fauna Brit. India, Birds, ed. 2, vol. 2, 1924, p. 181.

unique for the young of a thrush to have an unspotted plumage, and this genus may not belong to the Turdidae at all, as claimed by the older ornithologists.

#### 121. GRANDALA COELICOLOR Hodgson

*Grandala coelicolor* HODGSON, Journ. Asiatic Soc. Bengal, vol. 12, 1843, p. 447 (Nepal).

Two adult males, Likiang Mountains, 12,000 feet, May 8, were taken after a late snow storm.

These are brighter colored than two Indian specimens, as remarked by Stuart Baker,<sup>32</sup> but they do not appear to be any smaller, in fact they have somewhat larger bills.

#### 122. TURDUS GOULDI (Verreaux)

*Merula gouldi* VERREAUX, Nouv. Arch. Mus. d'Hist. Nat., vol. 6, 1871, p. 34 (W. Szechwan).

A fair series of adults and young from Tsao Chiang, March 18; Likiang Mountains, 10,000–15,000 feet, April, July, and August; Hofuping Mountains, Mekong Valley, November.

The males are very richly colored. The chief variation is in the color of the throat. In some specimens the chin and middle throat is spotted with white, while in others it is entirely lacking. The female is considerably paler than the male.

The young in various stages of the spotted plumage were taken in July and August.

#### 123. TURDUS RUFICOLLIS Pallas

*Turdus ruficollis* PALLAS, Reise Russ. Reichs, vol. 3, 1776, p. 694 (Dauria).

A small series of adults in various stages of plumage from: Near Feilung Chiao, March 20; between Lanping and Kanhoten, March 27; Kanhoten, March 28; Nguluko, 9,400 feet, April 5; Likiang Mountains, 12,500 feet, April 9; Likiang Plain, 9,000 feet, April 14; Youngning Plain, February; Mili Forests, Szechwan, February.

The females vary from a plumage hardly different from the males to one in which the throat and chest is only slightly mixed with rusty and much spotted with black. Apparently the full adult plumage is not acquired the first year.

#### 124. TURDUS EUNOMUS Temminck

*Turdus eunomus* TEMMINCK, Pl. Col., pl. 514, 1831 (Japan).

One female, between Pakang and Wamangai, March 16; one male, Mili Forests, 12,000, February.

<sup>32</sup> Fauna Brit. India, Birds, 2 ed., vol. 2, 1924, p. 90.

125. *TURDUS MUPINENSIS CONQUISITUS* Bangs

*Turdus auritus conquisitus* BANGS, Bull. Amer. Mus. Nat. Hist., vol. 44, 1921, p. 591 (Likiang Mts., Yunnan).

One adult female, two immature males, and three immature females, Likiang Mountains, 9,600 feet, April, July, and August.

126. *MONTICOLA SOLITARIA PANDOO* (Sykes)

*Petrocincla pandoo* SYKES, Proc. Zool. Soc. Lond., 1832, p. 87 (Western Ghats).

Five males and five females from: Feilung Chiao, March 20; Chien-chuan and vicinity, 8,000 feet, May 29–June 5; Yangtze Gorge, 7,000 feet, May 22–23; Ndagu, Yangtze, 7,600 feet, June; Tseh Chung Mountains, Mekong Valley, November.

Stuart Baker<sup>33</sup> gives *Monticola solitaria affinis* as the form of this thrush occurring in western China, but none of the specimens above have any chestnut on the wings which is said to characterize that race, or do specimens from western Szechwan. Rothschild<sup>34</sup> in his various papers on Yunnan birds has assigned his birds to *pandoo*, also.

127. *MONTICOLA ERYTHROGASTRA* (Vigors)

*Turdus erythrogaster* VIGORS, Proc. Zool. Soc. Lond., 1831, p. 171 (Himalayas).

Five adult males, four adult females, and one immature female, Likiang Mountains, July–August.

The altitude indicated upon one specimen is 15,000 feet.

The immature not fully grown was taken in August.

128. *CHAIMARRHORNIS LEUCOCEPHALA* (Vigors)

*Phoenicura leucocephala* VIGORS, Proc. Zool. Soc. Lond., 1830, p. 35 (Himalayas).

A large series of adults from: Tengyueh Plain, 5,300 feet, March 7; Likiang Mountains, 9,600–11,000 feet, April 20–May 11, and September; Whei Hsi, Mekong Valley, October; Tseh Chung Mountains, Mekong Valley, November; Yangtza, Mekong Valley, November; Hofuping Mountains, Mekong Valley, November; Youngning Plain, 10,000 feet, January–February.

Chinese birds seem to be a little deeper in color than the few specimens from northwest India available for comparison.

129. *PHOENICURUS AUROREUS LEUCOPTERUS* Blyth

*Phoenicura leucoptera* BLYTH, Journ. Asiatic Soc. Bengal, vol. 12, 1843, p. 962 (Malacca).

One male, between Pakang and Wamangai, March 16; one adult male, one adult female, and two young, Likiang Mountains, 11,000

<sup>33</sup> Fauna Brit. India, Birds, ed. 2, vol. 2, 1924, p. 175.

<sup>34</sup> Nov. Zool., vol. 28, 1921, p. 30; vol. 30, 1923, pp. 42, 255.

feet, April and August; one female, Tseh Chung Mountains, Mekong Valley, November; one male, mountain above Hunfuping, Mekong Valley, November.

The two young fully grown but still in the spotted plumage were taken in August.

The males have deeper black throats and backs and the breast more of a mars yellow than *P. a. aureus*.

### 130. PHOENICURUS SCHISTICEPS (Gray)

*Ruticilla schisticeps* GRAY, Cat. Mamm. Bds. Nepal Coll. Hodgson, 1846, pp. 69, 153 (Nepal).

One adult and one immature female, Likiang Mountains, 11,000–12,000 feet, April 15 and June; one adult male, Whei Hsi Mountains, November; one adult female, plain of Youngning, 11,000 feet, February; three adult males, forests of Mili, 12,000 feet, February.

### 131. PHOENICURUS HODGSONI (Moore)

*Ruticilla hodgsoni* MOORE, Proc. Zool. Soc. Lond., 1854, p. 26, pl. 58 (Nepal).

One female, Tengyueh, 5,600 feet, March 5; two males, between Tan-ten and Ssuching, March 24; one male and one female, Likiang Mountains, 9,500–9,600 feet, April 20 and 23; one male and two females, Tseh Chung Mountains, Mekong Valley, November; two males, Hofuping Mountains, Mekong Valley, November; one male, forests of Mili, 9,000–10,000 feet, Szechwan, February.

### 132. PHOENICURUS FRONTALIS SINAE Hartert

*Phoenicurus frontalis sinae* HARTERT, Bull. Brit. Orn. Club, vol. 38, 1919, p. 78 (Kansu).

One male, Kanhoten, Yünlooshan Range, March 29; one male, Ngulukuo, 9,500 feet, April 20; two males, three females, and one immature, Likiang Mountains, 9,500–15,000 feet, April–June and August; four adult males and two immature males, Yangtza Mountains, Mekong Valley, November.

An immature in the spotted plumage was taken in August. The two immature males taken in November have a distinctive plumage from the adult female; they are browner above, the throat and chest buckthorn brown, becoming yellow ochre on the breast and belly, and the rump and base of the outer tail feathers deeper (xanthine orange). . Evidently the adult plumage is not assumed until spring. The males taken in autumn have the blue areas with rusty edges to the feathers.

### 133. RHYACORNIS FULIGINOSA FULIGINOSA (Vigors)

*Phoenicura fuliginosa* VIGORS, Proc. Zool. Soc. Lond., 1831, p. 35 (Himalaya).

A fair series of adults and one immature from borders of Feilung-chiao, March 27; Nachupa Plain, 8,000 feet, May 30; Likiang Moun-

tains, 9,000–10,000 feet, June and September; Likiang Plain, 8,200 feet, August; Tseh Chung Mountains, Mekong Valley, November.

Two males in the National Museum from Fukien are much lighter in color and the wings browner than any in a large series from western China. They agree fairly well with a specimen from Formosa, but are even lighter. They belong either to *R. f. affinis* of Formosa or the form recently described by Stresemann<sup>35</sup> as *Chimarornis fuliginosa tenuirostris*.

An immature female, taken May 30, is similar to the adult, but is more buffy below, the back darker with still darker margins to the feathers and occasional narrow buffy shaft streaks, the wing coverts with larger and deeper buff spots, and the tail with much more white.

134. HODGSONIUS PHOENICUROIDES PHOENICUROIDES (Gray)

*Bradypterus phoenicuroides* GRAY (ex Hodgson MS.), Cat. Mamm. and Bds. Nepal, 1846, pp. 70, 153 (Nepal).

A good series of adults: Likiang Mountains, 13,000–15,000 feet, June–July.

The only Indian specimens available for comparison are too old and faded to be of any value for this purpose, but Stuart Baker (Fauna Brit. India, Birds, ed. 2, vol. 2, 1924, p. 21) assigns Yunnan birds to this race.

135. CALLIOPE TSCHებაIEWI Przewalski

*Calliope tschebaiewi* PRZEWALSKI, Mongol. i. Strana Tangut., vol. 2, 1876, p. 44, pl. 9, fig. 1 (Mountains of Kansu); Rowley's Orn. Misc., vol. 2, pt. 6, 1877, p. 180, pl. 54, fig. 1.

One adult male between Bayiwua and Heshwe, 10,000 feet, May 2; one adult and one immature male, Mount Dyinaloko, Likiang Mountains, 12,000–13,000 feet, June.

The immature has just begun to assume the red throat of the adult.

136. CALLIOPE DAVIDI GLORIOSA (Sushkin)

*Luscinia davidi gloriosa* SUSHKIN, Auk, vol. 43, 1926, p. 181 (Likiang Mts., Yunnan, China).

Five adult males, one immature male, and one adult female, Likiang Mountains, 9,500–10,000 feet, May, July, and September.

Of the female I have been unable to find any description, though this sex has been sent to Tring and reported upon by Rothschild.<sup>36</sup> The specimen that I take to be the adult female is marked as a male. It is slightly smaller than the male and quite different in general appearance, but the pattern of the tail is the same and the whitish

<sup>35</sup> Journ. für Orn., 1923, p. 364 (Siuhang, Kwangtung).

<sup>36</sup> Nov. Zool., vol. 30, 1923, p. 253.

feathers on the sides of the neck are present. Above it is like the male, but lacks the black frons; the lower parts and cheeks are a light cinnamon buff, becoming albescent on the belly.

The immature male is nearly full grown but still in the spotted plumage. It was taken in July.

One of these specimens was exchanged with the Russian Academy of Sciences after the above was written, and Dr. Peter Sushkin has compared it lately in Paris with the type of *Calliope davidi* Oustalet and found it to be different.

137. *IANTHIA RUFILATA PRACTICA* Bangs and Phillips

*Ianthia practica* BANGS and PHILLIPS, Bull. Mus. Comp. Zool., vol. 58, 1914, p. 292 (Loukouchai, Yunnan).

One adult male and two females, Likiang Mountains, 11,000–14,000 feet, April 12–18; five females, Hofuping Mountains, Mekong Valley, November.

The females are more olive brown above and are apparently slightly larger than *Ianthia cyanura*; they are also more brown, not so gray above, as summer specimens of *Ianthia rufilata*, with which they do not seem to agree in size. The more grayish plumage of the summer specimens being due to fading and wear.

The United States National Museum contains a pair of this species from Taipeishan District, Shensi, the male of which is lighter blue above and has the rump, frontal band, and lesser wing coverts much lighter. It probably represents a distinct form.

138. *TARSIGER CHRYSÆUS CHRYSÆUS* Hodgson

*Tarsiger chrysaëus* HODGSON, Proc. Zool. Soc. Lond., 1845, p. 28 (Nepal).

One adult male, two adult females, and three immature males, Likiang Mountains, 10,000–12,000 feet, June–September.

Two of the immatures are almost identical with the adult female, except they are a little brighter; the third immature has the feathers of the lower parts narrowly edged with dusky.

Stresemann<sup>37</sup> has named a form from Washan, Szechwan, *Tarsiger chrysaëus vitellinus*. I have a poor male from near Tatsienlu. It is a little brighter and has a smaller bill than the Yunnan male, but without any specimens from India for comparison I prefer to leave the Chinese form where other writers have for the present.

139. *LARVIVORA BRUNNEA BRUNNEA* Hodgson

*Larvivora brunnea* HODGSON, Journ. Asiatic Soc. Bengal, vol. 6, 1837, p. 102 (Nepal).

Seven adult males, two adult females, and two immatures from various stations in the Likiang Mountains, 8,000–10,000 feet, May–August.

<sup>37</sup> Journ. für Orn., 1923, p. 365.



Two adult males from Kashmir are slightly darker above and below and have wider white superciliaries.

The two immatures are in two stages of the spotted plumage; the younger bird browner above the spots above and below yellow ochre and the belly almost solidly of this color; the older bird is much grayer above with few or no spotting; the spots below whitish and the belly almost wholly so. The yellowish spotted bird is marked as a male and the white spotted bird as a female, but the differences are hardly sexual. They were taken in July.

140. *COPSYCHUS SAULARIS SAULARIS* (Linnaeus)

*Gracula saularis* LINNAEUS, Sys. Nat., ed. 12, 1766, p. 165 (Bengal).

One male, Yünlung, March 22; three males and four females without definite locality.

141. *SAXICOLA TORQUATA PRZEWALSKII* (Pleske)

*Prantincola maura*, var. *przewalskii* PLESKE, Wiss. Res. Przewalsky's Reisen, Vögel, vol. 1, 1889, p. 46, pl. 4, figs. 1, 2, 3 (Kansu).

A large series of adults and immatures from: Hungai, March 11; between Wamangai and Tsao Chiang, March 17; Tsao Chiang, March 18; between Feilung-chiao and Yünlung, March 21; between Yünlung and Tanten, March 23; between Lanping and Kanhoten, March 27; Yangtze Gorge, 7,400 feet, May 20-23; Lashipa Plain, 8,600 feet, May 27; Likiang Mountains, 8,200-12,000 feet, May-September; between Kanhoten and Shayangching, 8,600 feet, June 4; Tseh Chung Mountains, Mekong Valley, November; Hofuping Mountains, Mekong Valley, November; Forests of Youngning, February.

This is somewhat larger and considerably richer colored than *Saxicola torquata stejnegeri*.

Two young in the spotted plumage were taken in July and August; the latter considerably older is molting into the fall plumage.

142. *SAXICOLA CAPRATA BURMANICA* Baker

*Saxicola caprata burmanica* BAKER, Bull. Brit. Orn. Club, vol. 43, 1922, p. 19 (Pegu).

One male, without definite locality.

143. *OREICOLA FERREA HARTINGTONI* Hartert

*Oreicola ferrea haringtoni* HARTERT, Vögel paläarkt. Fauna, vol. 1, Heft 6, 1910, p. 711 (Lien-kiang bei Futschau, China).

A good series of adults and young from: Huigai, March 11; between Wamangai and Tsao Chiang, March 17; between Feilung-chiao and Yünlung, March 21; Lashipa Plain, 8,600 feet, May 27;

Likiang Mountains, 10,000–12,000 feet, May–September; Likiang Plain, 8,200 feet, August; Tseh Chung Mountains, Mekong Valley, October–November; Yetcha, Mekong Valley, November.

Young in the spotted plumage were taken in August.

144. *OREOCINCLA MOLLISSIMA MOLLISSIMA* (Blyth)

*Turdus mollissimus* BLYTH, Journ. Asiatic Soc. Bengal, vol. 2, 1842, p. 188 (Darjeeling).

One female, Likiang Mountains, May 8.

145. *LAISCOPIUS COLLARIS RIPPONI* (Hartert)

*Prunella collaris ripponi* HARTERT, Vögel paläarkt. Fauna, vol. 1, Heft 6, 1910, p. 766 (Gyi-dzin-shan).

Three males and two females, Likiang Mountains, 10,000–16,500 feet, May, June, and August.

146. *PRUNELLA STROPHIATA MULTISTRIATA* (David)

*Accentor multistriatus* DAVID, Ann. and Mag. Nat. Hist., ser. 4, vol. 7, 1871, p. 256 (Mupin).

A good series from: Likiang Mountains, 9,600–14,000 feet, April–August; Tseh Chung Mountains, Mekong Valley, November; Hofuping Mountains, Mekong Valley, November; Litiping Mountains, Mekong-Yangtze Divide, November.

147. *PRUNELLA IMMACULATA* (Hodgson)

*Accentor immaculatus* HODGSON, Proc. Zool. Soc. Lond., 1845, p. 34 (Nepal).

Two males and two females, Likiang Mountains, 9,500–10,000 feet, April 19–23; one male, forest of Youngning-Mili, February.

Family ENICURIDAE. Fork-tails

148. *ENICURUS LESCHENAULTI SINENSIS* Gould

*Enicurus sinensis* GOULD, Proc. Zool. Soc. Lond., 1865, p. 665 (Shanghai).

One male and two females, Likiang Mountains, April, June, and August; one male and one female, between Lanping and Lachiming, June 11; one male, Ashi, banks of Yangtze, July; one immature male, Likiang, 8,200 feet, August 23; male and female, Mili, Szechwan, February.

149. *MICROCICHLA SCOULERI SCOULERI* (Vigors)

*Enicurus scouleri* VIGORS, Proc. Zool. Soc. Lond., 1830, p. 174 (Himalaya).

One male, Yantza Mountains, Mekong Valley, November.

## Family SYLVIIDAE. Warblers

## 150. DUMETICOLA THORACICA THORACICA Blyth

*Dumeticola thoracica* BLYTH, Journ. Asiatic Soc. Bengal, vol. 14, 1846, p. 584 (Nepal).

A fair series, Likiang Mountains, 12,000 feet, June–August.

Four immature birds taken in August and September are darker above than the adult and have the lower parts marguerite yellow, the flanks light brownish olive, the foreneck and chest spotted with buffy-olive, the under tail coverts olive with yellowish margins.

## 151. TRIBURA TACZANOWSKIA (Swinhoe)

*Locustella taczanowskia* SWINHOE, Proc. Zool. Soc. Lond., 1871, p. 355 (Trans-Baikal).

One male, Likiang Mountains, 12,000 feet, May 12.

This specimen has a few almost obsolete dusky spots on the chest. Stuart Baker<sup>28</sup> in his description does not mention these. The specimen is very much like *T. major*, except for its much smaller bill. It is more of a brownish olive on the back and the spots on the chest are fewer in number, lighter, and almost obsolescent. I have no specimens of *T. taczanowskia* for comparison.

## 152. FRANKLINIA GRACILIS (Franklin)

*Prinia gracilis* FRANKLIN, Proc. Zool. Soc. Lond., 1831, p. 119 (Vindhyan Hills).

One male, Yangtze Gorge, 4,800 feet, May 17.

## 153. ACANTHOPNEUSTE MAGNIROSTRIS (Blyth)

*Phylloscopus magnirostris* BLYTH, Journ. Asiatic Soc. Bengal, vol. 12, 1843, p. 966 (Calcutta).

Three males and three females, Likiang Mountains, 12,000 feet, May, June, and August; one male, Bayiwua, 10,000 feet, June; one female, Likiang Plain, 8,200 feet, August.

One of the females taken in August is brighter, more yellowish green above, more tinged with yellow below, the superciliary and wing band deeper and more pronounced. The bill is slightly smaller. I take it to be a bird of the year in fresh autumnal plumage.

## 154. ACANTHOPNEUSTE REGULOIDES CLAUDIAE La Touche

*Acanthopneuste trochiloides claudiae* LA TOUCHE, Bull. Brit. Orn. Club, vol. 43, 1922, p. 22 (Mengtz, Yunnan).

Three males, five females, and three unsexed, Likiang Mountains, 9,600–12,000 feet, April–August; one male, without locality, March 25.

I am not satisfied that the above series has been correctly determined. They are very close to a rather poor specimen from Nepal;

<sup>28</sup> Fauna Brit. India, Birds, ed. 2, vol. 2, 1924, p. 404.

in fact, I can not detect any appreciable difference between them. A male from Shensi and another from Hupeh are not so strongly tinged with yellow below, the occipital dark mark is darker; they evidently represent a different form that for the present I do not wish to add to the confusion by naming.

Stresemann<sup>39</sup> has written a review and without more material it would be wise to accept his conclusions.

155. *REGULOIDES HUMII PRAEMIUM* Mathews and Iredale

*Reguloides humii praemium* MATHEWS and IREDALE, Aus. Av. Record, vol. 3, 1915, p. 45 (Russia).

One male, Likiang, 8,200 feet, May 15.

This specimen is in a bad state of preservation. The wing bars are almost worn off; only the bar on the greater wing coverts shows faintly. Above it is more greenish and below more tinged with yellowish than the majority of specimens from east China. It is quite possible that it does not belong to this form at all, but I do not know where else to place it.

156. *REGULOIDES PROREGULUS FORRESTI* (Rothschild)

*Phylloscopus proregulus forresti* ROTHSCILD, Nov. Zool., vol. 28, 1921, p. 45 (Lichiang Range, Yunnan).

One unsexed, Nguluko, April 13; two females, Likiang Mountains, 11,000 feet, April and June.

157. *REGULOIDES PULCHER PULCHER* (Blyth)

*Phylloscopus pulcher* BLYTH, Journ. Asiatic Soc. Bengal, vol. 14, 1845, p. 592 (Nepal).

One male and one female, Likiang Mountains, 12,000 feet, April and July; one male, Tseh Chung Mountains, Mekong Valley, October; one male, mountains near Yangtza, Mekong Valley, November; two males and one female, Hofuping Mountains, Mekong Valley, November.

158. *OREOPNEUSTE ARMANDI* (Milne-Edwards)

*Abrornis armandi* MILNE-EDWARDS, Nouv. Arch. Mus. Paris, vol. 1, Bull. 1865, p. 22, pl. 2, fig. 1 (N. China).

One unsexed, Heshwe, 10,000 feet, May 2; one female, Bayiwua, east of Likiang Mountains, June; two males and four females, Likiang Mountains, 11,000–12,000 feet, May, June, and September.

This species I failed to recognize from the poor descriptions consulted and sent three of the above specimens to Outram Bangs, who kindly identified them. The English ornithologists compare it in their descriptions with *Oreopneuste fuscata*, a species which it

<sup>39</sup> Orn. Monatsb., vol. 32, 1924, pp. 8–9.

is extremely doubtful belongs in the same genus. The latter has a proportionally shorter tail in relation to the wing. *Oreopneuste davidii* Swinhoe (= *Abrornis armandi* Milne-Edwards) is the type of *Oreopneuste* Swinhoe by monotypy. *Phaeorhadina* has been proposed by the Mathews and Iredale<sup>40</sup> for *Phyllopneuste fuscata* Blyth, but whether the other species (except *armandi*) placed in *Oreopneuste* by Sharpe<sup>41</sup> really belong with *fuscata* I am not prepared to say; they are very similar in structure so far as I have examined them, however, except *Phylloscopus neglectus* Hume, which belongs in *Acanthopneuste*. *Horornis* Hodgson as usually constituted is also in need of revision, it seems to me. The present species bears a striking resemblance in coloration to *Horornis acanthizoides*; it is a larger bird, however. *Horornis* has only 10 tail feathers, while *Oreopneuste* has 12; otherwise they are structurally much alike, but owing to this difference had better be kept separate.

As descriptions in English of this species are poor, a few notes on the plumages may be of help to other investigators. The May and June taken birds are light-brownish olive on the upper parts, a little deeper on the top of the head; superciliary stripe extending to nape, marguerite yellow; loreal and postocular streaks darker than top of head; cheeks and sides of neck, deep olive-buff with a cinnamon wash; throat and foreneck grayish white with sparse light yellow streaks; chest, breast, and belly barium yellow, with sparse grayish white and buffy olive streaks; under tail coverts, Naples yellow.

The fall-taken birds are buffy olive above or deeper; the superciliary is deeper yellow; the throat and foreneck with an increase of yellowish streakings; the chest, breast, and belly a deeper yellow, with a few whitish streaks; under tail coverts honey yellow; the flanks suffused with ecru-drab.

The June birds in worn plumage taken in the Likiang Mountains would seem to indicate it was a summer resident there. It was originally described from north China. It may be the Yunnan birds are not the same, which might account for the discrepancies in the descriptions. I have been unable to compare them.

159. PHAEORHADINA FUSCATA FUSCATA (Blyth)

*Phyllopneuste fuscata* BLYTH, Journ. Asiatic Soc. Bengal, vol. 11, 1842, p. 113 (Calcutta).

One unsexed, Heshwe, 9,600 feet, April 30; one female, Likiang Mountains, 11,000 feet, September; one female, Whei Hsi Mountains, October–November.

The unsexed specimen from Heshwe is considerably larger, darker above, and lighter below than the two females. It may be a male.

<sup>40</sup> Aus. av. Record, vol. 3, 1917, p. 116.

<sup>41</sup> Hand-List, vol. 4, 1903, p. 214.

## 160. PHAEORHADINA SUBAFFINIS (Grant)

*Oreopneuste subaffinis* GRANT, Bull. Brit. Orn. Club, vol. 10, 1900, p. 37 (Pu-an-ting, S. W. Kweichu).

One male, between Tsao Chiang, March 17; one male, two females, and one unsexed, Likiang Mountains, 10,000–11,000 feet, April 8–June.

This closely resembles *P. affinis*, but the chest is strongly tinged with ochraceous and it is a trifle smaller. If the two birds did not apparently breed together they would only be considered forms of one species. It is quite possible they may occupy different levels in the breeding seasons.

## 161. PHAEORHADINA AFFINIS (Tickell)

*Motacilla affinis* TICKELL, Journ. Asiatic Soc. Bengal, vol. 2, 1833, p. 576 (Jungles of Borabhum and Dholbun).

Three females and one unsexed, Likiang Mountains, 8,200–12,000 feet, April 20–May 15; one female, Hofuping Mountains, Mekong Valley, November.

The lower parts vary from a lemon to a picric yellow.

## 162. HOREITES BRUNNIFRONS UMBRATICUS Baker

*Horeites brunniifrons umbraticus* BAKER, Bull. Brit. Orn. Club, vol. 44, 1924, p. 63 (Sheweli-Salwin Divide, Yunnan).

One male and two females, Likiang Mountains, 10–12,000 feet June, August, and September.

163. SEICERCUS <sup>42</sup> BURKII TEPHROCEPHALUS (Anderson)

*Culicipeta tephrocephalus* ANDERSON, Proc. Zool. Soc. Lond., 1871, p. 213 (Bhamo, Burma).

One adult unsexed, between Likiang and Tuinakou, 10,000 feet, May 16; five males and two females, Likiang Mountains, 10,000–11,000 feet, May–August.

An immature female taken in July and an immature male taken in August of about the same size as the adult lack the gray median stripe of the head, it being olive like the back; the backs are more of a citrine; the lower parts are lighter; and the bill is tipped with yellow.

In this plumage they resemble *S. b. burkii* but are not such a deep yellow below. The August specimen is molting into the bright yellow breast of the adult.

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<sup>42</sup> For the use of *Seicercus* in place of *Cryptolopha*, see Baker, Fauna Brit. India, Birds, ed. 2, vol. 2, 1924, p. 485.

164. *SUYA CRINIGERA YUNNANENSIS* Harington

*Suya crinigera yunnanensis* HARRINGTON, Bull. Brit. Orn. Club, vol. 31, 1913, p. 110 (Yunnan).

One male, Yangtze gorge, 4,600 feet, May 17; one male and one female, Likiang Mountains, 8,500 feet, July and August; one adult without definite locality.

The series of this species at my command is much too small to reach any definite conclusions regarding the numerous races into which it has been divided. Birds from Fukien and Hunan (*Suya crinigera parumstriata* David) are browner and less streaked above and less tinged with buffy below when compared with the Yunnan series.

165. *SUYA SUPERCILIARIS SUPERCILIARIS* Anderson

*Suya superciliaris* ANDERSON, Zool. Res. Two Exp. Western Yunnan, 1878, p. 642, pl. 51, fig. 1 (Momiën).

One male, Tsao Chiang, March 18.

Two males from the Langbian Peaks, south Annam, are considerably darker above.

## Family REGULIDAE. Kinglets

166. *REGULUS REGULUS YUNNANENSIS* Rippon

*Regulus yunnanensis* RIPPON, Bull. Brit. Orn. Club, vol. 19, 1906, p. 19 (Yangtze R., W. Yunnan).

One male, Hofuping Mountains, Mekong Valley, November; one male, Tseh Chung Mountains, Mekong Valley, November.

167. *SYLVIPARUS MODESTUS SATURATIONIOR* Rippon

*Sylviparus saturationior* RIPPON, Bull. Brit. Orn. Club, vol. 16, 1906, p. 87 (Mt. Victoria, Chin Hills).

One male, between Lanping and Kanhoten, March 27; one female, without definite locality, March 25; one unsexed, Likiang Mountains, 11,000 feet, April 15; one male and one female, mountains near Yangtze, Mekong Valley, November; one male, Hofuping Mountains, Mekong Valley, November.

## Family PRIONOPIDAE. Wood Shrikes

168. *HEMIPUS PICATUS CAPITALIS* (McClelland)

*Muscicapa ? capitalis* MCCLELLAND, Proc. Zool. Soc., 1839, p. 157 (Assam).

One male, Kantingai (four days north of Tenyueh), 2,600 feet, March 18.

## Family LANIIDAE. Shrikes

## 169. LANIUS TEPHRONOTUS (Vigors)

*Collurio tephronotus* VIGORS, Proc. Zool. Soc. Lond., 1831, p. 43 (Himalaya).

A good series from: Tsao Chiang, March 18; Likiang Plain, 9,400 feet, May 4; Likiang, 8,200 feet, May 15; between Likiang and Ganhaitze, 10,000 feet, May 19; Likiang Mountains, 9,500–11,000 feet, April 23–September; Limestone Range, east of the Likiang Mountains, 10,000 feet, July 2; Whei Hsi Mountains, Mekong Valley, November; Tseh Chung Mountains, Mekong Valley, November.

Specimens in worn plumage have the gray of the back darker and the red of the rump lighter than birds in unworn plumage.

One specimen (297168) has a white line bordering the black mark from just forward of the eye to near the end of the ear coverts, and there is a slight indication of it in one or two other specimens.

## 170. LANIUS NIGRICEPS NIGRICEPS (Franklin)

*Collurio nigriceps* FRANKLIN, Proc. Zool. Soc. Lond., 1831, p. 117 (Ganges and Nerbudda).

One female, between Pakang and Wamangai, March 16; one female, Tsao Chiang, March 18.

## 171. LANIUS CRISTATUS CRISTATUS Linnaeus

*Lanius cristatus* LINNAEUS, Sys. Nat., ed. 10, 1758, p. 93 (Bengal).

Two immature males, Likiang Mountains, 8,500 feet, August and September.

## Family PARADOXORNITHIDAE. Parrot-bills

## 172. PARADOXORNIS GUTTATICOLLIS David

*Paradoxornis guttaticollis* DAVID, Nouv. Arch. Mus. Paris, vol. 7, Bull. 1871, p. 14 (Szechwan and Mupin).

One female, without locality.

The black of the ear coverts is more extensive and the spotting on the chest more pronounced than in a female from Fukien, the only specimen with which I have been able to compare it.

## 173. SUTHORA UNICOLOR SATURATIO (Rothschild)

*Paradoxornis unicolor saturatio* ROTHSCHILD, Nov. Zool., vol. 28, 1921, p. 54 (Shewell-Salwin Divide, Yunnan).

Two adults, between Dyinaloko and Bayiwua, May 1; three males and two females, east slopes Likiang Mountains, July; one male, west slopes of Likiang Mountains, July.



174. *SUTHORA WEBBIANA RICKETTI* (Rothschild)

*Paradoxornis webbiana ricketti* ROTHSCILD, Bull. Brit. Orn. Club, vol. 43, 1922, p. 11 (Yangtze Valley, Yunnan).

One male, between Yulo and Likiang, west slopes of the mountains, 9,000 feet, May 24.

This is so very different from *Suthora webbiana* that I have grave doubts if it should be made a race of this species, but not having specimens of *Suthora styani* Rippon I prefer to leave it in abeyance for the present.

175. *SUTHORA FULVIFRONS CYANOPHRYS* David

*Suthora cyanophrys* DAVID, Journ. trois Voy. Emp. Chin., vol. 1, 1875, p. 345 (Chensi meridian).

Two females and one unsexed, Likiang Mountains, 10,000–12,000 feet, April and June.

## Family PARIDAE. Chickadees

176. *PENTHESTES PALUSTRIS DEJEANI* Oustalet

*Parus dejeani* OUSTALET, Bull. Mus. Paris, vol. 3, 1897, p. 209 (Ta-tsien-lu).

One male Peshwe-ho, Likiang Mountains, 11,000 feet, April 25.

The United States National Museum has recently received a male specimen from Shanghai taken February 26, without a bill, that does not differ from the Yunnan bird essentially; it is probably only a winter straggler.

177. *BAEOLOPHUS DICHROUS WELLSI* (Baker)

*Parus dichrous wellsi* BAKER, Bull. Brit. Orn. Club, vol. 38, 1917, p. 8 (Yangtze big bend, W. Yunnan).

A fair series of adults from: Likiang Mountains, 10,000–12,000 feet, April–July; Mount Dyinaloko, 12,000 feet, April 29; Tseh Chung Mountains, Mekong Valley, November; mountains near Yangtza, Mekong Valley, November; mountains of Hofuping-Yangtza, November.

This race is a darker, clearer gray above and lighter below than the only specimen of *B. d. dichrous*, with which it has been compared.

178. *PERIPARUS ATER AEMODIUS* (Hodgson)

*Parus aemodius* HODGSON, Journ. Asiatic Soc. Bengal, vol. 13, 1844, p. 943 (Nepal).

One adult male, Likiang Mountains, 14,000–15,000 feet, April 16.

179. *PERIPARUS RUFONUCHALIS BEAVANI* (Jerdon)

*Lophophanes beavani* JERDON (Blyth Ms.) Birds India, vol. 2, 1863, p. 275 (Mt. Tongloo, Sikkim).

Two males and one unsexed, Likiang Mountains, 10,000–12,000 feet, April; one male, Tseh Chung Mountains, November; one female, forests of Youngning, February.

180. *PARUS MAJOR TIBETANUS* Hartert

*Parus major tibetanus* HARTERT, Vögel paläarkt. Fauna, vol. 1, Heft 3, 1905, p. 346 (Chaksam, Tsongpo Valley, Tibet).

A small series of adults and young between Pakang and Wamangai, March 16; Ngulukou, 10,000 feet, April 6 and 7; Likiang Mountains, 8,500–10,000 feet, April and June; between Dyinaloko and Bayiwua, 11,000 feet, May 2; Yangtza Mountains, Mekong Valley, November.

Larger, with less yellow on the mantle; outer tail feather more extensively white than in forms to the north and east of it. So many forms have been named from China within recent years that it is difficult to decide which are valid without a more intensive study than I am able to devote to it.

181. *PARUS MONTICOLUS YUNNANENSIS* La Touche

*Parus monticolus yunnanensis* LA TOUCHE, Bull. Brit. Orn. Club, vol. 42, 1922, p. 51 (Milati, Yunnan).

Seven adults, Likiang Mountains, 10,000–11,000 feet, April–September.

This series when compared with a small series from Kashmir has the white markings on the wings less marked, the lower back and rump a deeper, clearer gray, and it appears to be slightly larger in size.

182. *AEGITHALISCUS CONCINNUS TALIFUENSIS* Rippon

*Aegithaliscus talifuensis* RIPPON, Bull. Brit. Orn. Club, vol. 14, 1903, p. 18 (Gyi-dzin-shan, east of Talifu, Yunnan).

One adult, Yünlung, March 22; one adult, Lashipa, June 6; one adult female, Likiang Plain, 8,200 feet, August 21.

This does not seem to be a well-marked race, but Rothschild<sup>43</sup> and La Touche<sup>44</sup> with more ample material recognize it. The pectoral band is darker and narrower than in birds from central and eastern China. A series from Suifu, Szechwan, seems to agree with the eastern race.

183. *AEGITHALISCUS BONVALOTI* (Oustalet)

*Acredula bonvaloti* OUSTALET, Ann. Sci. Nat., Zool., ser. 7, vol. 12, 1891, p. 286, pl. 9, fig. 1 (Ta-tsien-lu and Pendjama, Szechwan).

Nine adults and one immature from Likiang Mountains, 9,600–12,000 feet, April–June; between Likiang and Tuinakou, 10,000 feet, May 16; and Hofuping Mountains, Mekong Valley, November.

<sup>43</sup> Nov. Zool., vol. 30, 1923, p. 51.

<sup>44</sup> Ibis, 1923, p. 311.

The single specimen from the last locality is a female and much darker on the chest, ear coverts, and nuchal region than any others in the series and may represent another race.

The specimen I have listed above as the immature is quite distinct from the adult. It is cream-buff below; the chest crossed by a band of black spots; the throat with two narrow black lines from the chin; the nuchal and auricular region much lighter than in the adult; and the feet (in the skin) honey yellow instead of blackish brown. It is quite a different looking bird from the adult, but if not the young of this species, I do not know where to place it.

184. *AEGITHALOS CAUDATUS VINACEUS* (Verreaux)

*Mecistura vinacea* VERREAUX, Nouv. Arch. Mus. Paris, vol. 6, Bull., 1870, p. 39 (Ourato).

One male and one female, Lashipa Plain, 8,500 feet, May 28.

This seems to be considerably south of the published range of this form.

Family SITTIDAE. Nuthatches

185. *SITTA SINENSIS NEBULOSA* La Touche

*Sitta europaea nebulosa* LA TOUCHE, Bull. Brit. Orn. Club, vol. 42, 1922, p. 55 (new name for *Sitta europaea obscura* La Touche, preoccupied; Milati, Yunnan).

A good series of adults: Likiang Mountains, 8,200–15,000 feet, April–September; near Tsilikiang, Yangtze Valley, 5,000–6,000 feet, May 17; between Ganhaitze and Yangtze Gorge, 9,000 feet, May 20; mountains near Yangtza, Mekong Valley, November; Hofuping Mountains, Mekong Valley, November.

This series exhibits two phases of plumage. A dark phase, somewhat resembling *Sitta s. sinensis* below but not near so dark, and a light phase somewhat resembling *Sitta nagaensis* below but somewhat darker. The light phase were all taken April and May; the dark phase in late summer and fall (one in May), so fading is probably the cause. The dark phase resembles *Sitta s. sinensis* but is much lighter below, but a darker, clearer gray on the back and the bill (in the skin) bluish at the base instead of yellowish.

186. *SITTA YUNNANENSIS* Grant

*Sitta yunnanensis* GRANT, Bull. Brit. Orn. Club, vol. 10, 1900, p. 37 (Weiyuan, S. Yunnan).

A fair series of adults and immature: Kanhoten, Nanchu Plain, March 29, and various stations in the Likiang Mountains, 10,000–11,000 feet, early April to July.

In pine forests.

Besides the differential characters given by the original describer, all the adults have a narrow whitish superciliary line more or less distinct and the white on the outer tail feathers reduced to almost the vanishing point.

One immature female, taken May 24, and about size of the adult or only a trifle smaller, has the black line on the side of the neck reduced to only an indication of neutral gray on the ear coverts, and the superciliary is barely indicated by a little lighter gray than the pileum; the bill is considerably shorter than in the adult.

This is a very distinct species, apparently not closely related to any other Chinese form.

#### 187. *SITTA MAGNA* Ramsay

*Sitta magna* RAMSAY, Proc. Zool. Soc. Lond., 1876, p. 677 (Karennee).

One adult, between Dyinaloko and Bayiwua, 11,000 feet, May 2; one adult, near Bayiwua, 10,000 feet, May 2; and one adult male, Likiang forests, 8,200 feet, August.

### Family CERTHIIDAE. Creepers

#### 188. *CERTHIA FAMILIARIS KHAMENSIS* Bianchi

*Certhia khamensis* BIANCHI, Sharpe's Handl. Birds, vol. 4, 1903, pp. 355, 360 (Kansu; Szechwan; S. E. Tibet).

Two males, Likiang Mountains, 12,000 feet, April 9; two males, mountains near Yangtza, Mekong Valley, November; one male, Hofuping Mountains, Mekong Valley, November.

#### 189. *TICHODROMA MURARIA* (Linnaeus)

*Certhia muraria* LINNAEUS, Sys. Nat., ed. 12, 1766, p. 184 (South Europe).

One male, Kangpu Mountains, Mekong Valley, October; one male, mountains near Yangtza, Mekong Valley, November; one female, Youngning Plain, 9,600 feet, February.

While the United States National Museum contains quite a series of this species from Asia, it only possesses a pair from Europe. These two are lighter and have longer bills than any in the Asiatic series, and it may eventually be necessary to recognize an eastern and western race.

### Family ZOSTEROPIDAE. Silver-eyes

#### 190. *ZOSTEROPS PALPEBROSA SIMPLEX* Swinhoe

*Zosterops simplex* SWINHOE, Ibis, 1861, p. 331 (Amoy).

Three males and two females, Likiang Mountains, 8,500–9,000 feet, May and August; one male, Likiang Plain, 8,200 feet, August.

This series agrees with birds from Fukien.

191. *ZOSTEROPS PALPEBROSA PALPEBROSA* (Temminck)

*Sylvia palpebrosa* TEMMINCK, Pl. Col., pl. 293, fig. 3, 1924 (Bengal).

One female, between Kantingai and Muanglei, Salween Valley, March 15; one male and two females, between Yünlung and Tanten, March 23; one male, without locality or date.

The birds in this series are smaller and much darker, both above and below, than the series identified above as *simplex*, and represent evidently a well-marked form, but what name to use for it is rather difficult to determine. *Zosterops mussoti* Oustalet,<sup>45</sup> Rothschild<sup>46</sup> says is only a synonym of *simplex*; *Zosterops setschuana* Reichenow<sup>47</sup> is evidently only a renaming of *Zosterops mussoti*, having the same type locality. Even if *mussoti* should prove separable, the present form can not well be it, for the series I have identified as *simplex* would come in between. Most likely it belongs to one of the Burma forms, as it comes from near the western border of Yunnan, and the series agrees better with Indian specimens than with those from further east in China, but my series of Indian birds is unsatisfactory. Most of the Indian specimens are brighter, but there are one or two that match west Yunnan birds very well; they are without definite localities, however.

## Family DICAETIDAE. Flower-peckers

192. *DICAETUM IGNIPECTUS IGNIPECTUS* (Blyth)

*Myzanthus ignipectus* BLYTH, Journ. Asiatic Soc. Bengal, vol. 12, 1843, p. 983 (Nepal and Bhutan).

One male and one female, between Tuinakou and Likiang, 8,300–9,000 feet, May 18; one male, between Yulo and Nguluko, west slopes of Likiang Mountains, May 24.

193. *PACHYGLOSSA MELANOZANTHA* Blyth

*Pachyglossa melanozantha* BLYTH, Journ. Asiatic Soc. Bengal, vol. 12, 1843, p. 1010 (Nepal).

A fine series of adults from various stations in the Likiang Mountains, 13,000 feet, May–July.

## Family NECTARINIIDAE. Sun Birds

194. *AETHOPYGA DABRYII DABRYII* (Verreaux)

*Nectarinia dabryii* VERREAUX, Rev. et Mag. Zool., 1867, p. 173, pl. 15 (Szechwan).

A good series of adult males and females between Failungchiao and Yünlung, March 21; Likiang Mountains (various stations), 9,000–12,000 feet, April–July.

<sup>45</sup> Ann. Sci. Nat. (Zool.), ser. 7, vol. 12, 1891, p. 289.

<sup>46</sup> Nov. Zool., vol. 28, 1921, p. 57.

<sup>47</sup> Journ. f. Orn., 1915, p. 125.

Two males from Hupeh are a duller less brilliant red on the backs and chest, the rump and belly a lighter yellow, the middle tail feathers more of a violet purple than any in the Yunnan series; the Hupeh birds also have smaller bills and shorter tails. I have named the Hupeh race *Aethopyga dabryi bangsi*.<sup>48</sup>

195. *AETHOPYGA NIPALENSIS* (Hodgson)

*Cinnyris nipalensis* HODGSON, Ind. Rev., vol. 2, 1837, p. 273 (Nepal).

One male, Hsuehshanting, 9,000 feet, March 13.

Family MOTACILLIDAE. Wagtails and Pipits

196. *MOTACILLA ALBA HODGSONI* Blyth

*Motacilla hodgsoni* BLYTH, Ibis, 1865, p. 49 (Nepal and Sikkim).

A fair series of adults and immatures from: Tsaochiang, March 18; Yünlung, March 22; Likiang Mountains, 9,400–10,000 feet, April 10–August; Likiang Plain, August; between Likiang and Ganhaitze, 10,000 feet, May 19; Chienchuan, 8,000 feet, June 5.

A small series from Kashmir with which the above specimens have been compared have more white in the wing, especially to the outer margins of the flight feathers; specimens from western Szechwan agree with Yunnan birds.

197. *MOTACILLA ALBA LEUCOPSIS* Gould

*Motacilla leucopsis* GOULD, Proc. Zool. Soc. Lond., 1837, p. 78 (India).

One female, Likiang Plain, 8,200 feet, August; one female, Likiang Mountains, 9,000 feet, September.

198. *MOTACILLA ALBA BAICALENSIS* Swinhoe

*Motacilla baicalensis* SWINHOE, Proc. Zool. Soc. Lond., 1871, p. 363 (Eastern Asia).

One male, Likiang Mountains, 9,000 feet, September; one female, plain of Youngning, February.

199. *MOTACILLA CINEREA CASPICA* (S. G. Gmelin)

*Parus caspicus* S. G. GMELIN, Reise durch Russland, vol. 3, 1774, p. 104, pl. 20, fig. 2 (Enzeli, Caspian Sea).

Four males and two females, Likiang Mountains, 8,500–9,800 feet, April 29, August, and September; one male, Tseh Chung Mountains, Mekong Valley, November; one female, without further data.

200. *BUDYTES FLAVA SIMILLIMA* (Hartert)

*Motacilla flava simillima* HARTELT, Vögel paläarkt. Fauna, vol. 3, Heft 3, 1905, p. 289; Nov. Zool., vol. 26, 1919, p. 167 (Sula Id.).

Two males and one female, Likiang Mountains, 8,500 feet, August.

<sup>48</sup> Proc. Biol. Soc., Wash., vol. 38, 1925, p. 11.

201. *ANTHUS HODGSONI YUNNANENSIS* Uchida and Kuroda

*Anthus maculatus yunnanensis* UCHIDA and KURODA, Annot. Zool. Jap., vol. 2, 1916, p. 134 (Mengtze, Yunnan).

Four males and four females, Likiang Mountains, 11,000–13,000 feet, April 17–September; one female, near Lanping, May 30; one male, mountains near Yangtza, Mekong Valley, November; one female, Hofuping Mountains, Mekong Valley, November.

The above series, when compared with birds from Kamchatka, eastern China, and Japan in the same stage of plumage, average more heavily streaked above, especially on the head; there appears to be no appreciable difference in size. While the United States National Museum contains a large series of this species, most of the specimens were taken on migration and are hardly comparable. Breeding birds are quite grayish on the back, the olive wash of fall birds almost or quite disappearing by fading. Even so, the fall Yunnan birds have more yellowish in the olive of the back and are more heavily streaked above.

Two female specimens from Kansu, taken in May, have been prepared with plaster which makes the plumage appear lighter than it otherwise would; making allowances for this, they appear to agree with northern and eastern birds.

*Anthus hodgsoni* Richmond<sup>49</sup> is a substitute name for *Pipastes maculatus* Jerdon,<sup>50</sup> preoccupied, and naturally has the same type locality (India). Jerdon's type was a migrant bird; it may prove the same as the Yunnan race, in which case *Anthus hodgsoni berzowskii* Sarudny<sup>51</sup> would be available for the northern form.

202. *ANTHUS ROSEATUS* Blyth

*Anthus roseatus* BLYTH, Journ. As. Soc. Bengal, vol. 16, 1847, p. 437 (Nepal).

One male and one female, Likiang Mountains, April 22 (12,000 feet) and August.

## Family ALAUDIDAE. Larks

203. *ALAUDA GULGULA COELIVOX* Swinhoe

*Alauda coelivox* SWINHOE, Zoologist, 1859, p. 6724 (Amoy).

One male, one female, and one unsexed, Likiang Mountains, 9,500–10,000 feet, April 7–23; one unsexed, Likiang Plain, 9,000 feet, April 14.

<sup>49</sup> Blackwelder, Research. in China, vol. 1, pt. 2, 1907, p. 493.

<sup>50</sup> Birds, India, vol. 3, 1864, p. 873.

<sup>51</sup> Orn. Monatsb., 1909, p. 41.

## Family FRINGILLIDAE. Sparrows

204. *EOPHONA MIGRATORIA MIGRATORIA* Hartert

*Eophona melanura migratoria* HARTERT, Vögel paläarkt. Fauna, vol. 1, Heft 1, 1903, p. 59 (Sidimi).

An immature male (acquiring the first winter plumage, marked female), Likiang Mountains, 9,500 feet, September.

205. *MYCEROBAS MELANOXANTHUS* (Hodgson)

*Coccothraustes melanoxanthus* HODGSON, Asiat. Res., vol. 9, 1836, p. 150 (Himalayas).

One adult male, four immature males, and one female, Likiang Mountains, 11,000–14,000 feet, July; one female, Lameko Mountain, north of Lashipa, July.

The only specimens available for comparison are an adult male from India without definite locality and a female from Darjiling. The adult male is old and somewhat faded. It has a larger bill, a larger white wing speculum, the white markings on the secondaries and secondary coverts more extensive, the back a browner black, and the breast a lighter yellow than the Yunnan male, the last two characters probably due to the age of the specimen. The Indian female has also a larger bill, is browner on the back, and lighter below than the Yunnan female; the white markings on the wing are no greater, however. It is probable the Chinese bird represents a distinct form, but more material is needed before deciding this point.

206. *MYCEROBAS CARNIPES* (Hodgson)

*Coccothraustes carnipes* HODGSON, Asiat. Res., vol. 9, 1836, p. 151 (Nepal).

One male, Likiang Mountains, July; one male and two females, Hofuping Mountains, Mekong Valley, November; two males and one female, forests of Mili, 12,000 feet, southwest Szechwan, February.

207. *PERISSOSPIZA ICTEROIDES AFFINIS* (Blyth)

*Hesperiphona affinis* BLYTH, Journ. Asiatic Soc. Bengal, vol. 24, 1855, p. 179 (Sikkim).

Two adult males and two adult females, Likiang Mountains, 12,500–13,000 feet, May–July.

208. *PROCARDUELIS RUBESCENS SATURATIONIOR* Rothschild

*Procarduelis rubescens saturationior* ROTHSCHILD, Bull. Brit. Orn. Club, vol. 43, 1922, p. 12 (Shewell-Salwin Divide).

One adult male and five adult females, Likiang Mountains, 11,000–12,000 feet, June.



209. *PROCARDUELIS NIPALENSIS INTENSICOLOR* Baker

*Procarduelis nipalensis intensicolor* BAKER, Bull. Brit. Orn. Club, vol. 45, 1925, p. 92 (Mekong-Salwin Divide, Yunnan).

One male and four females, Likiang Mountains, 10,000 feet, June–September.

210. *SPINUS AMBIGUUS* (Oustalet)

*Chrysomitris ambigua* OUSTALET, Bull. Mus. Paris, vol. 2, 1896, p. 186 (Yunnan).

One female, Chin Chou and Feilung Chiao, Mekong Valley, March 20; seven adults (five males and two females), Likiang Mountains, 10,000–12,000 feet, May 12–June; one male, Yangtze Gorge near Yulo, 7,400 feet, May 20; one female, Lashipa Plain, 8,600 feet, May 27; one immature male, Limestone Range, east of the Likiang Mountains, 10,000 feet, July 2; one male, mountains near Yangtza, Mekong Valley, November; one male, without definite data.

The male taken in November has the feathers of the lower parts broadly tipped with drab and the yellow subapical streak almost concealed. As the season advances these tips evidently wear off, leaving the lower-parts yellow streaked with warbler green. The feathers of the lower-parts also have a concealed subbasal spot of white.

The males have the cap and sides of face dull black; in the females it is only olivaceous-black (1). The female is generally duller colored, otherwise the sexes are much alike.

The immature male taken July 2, while full size, resembles the adult, except it is light brownish olive above streaked with blackish; below it is a light chalcedony yellow streaked with blackish, the center of the breast and belly becoming more yellowish. It lacks the black cap.

211. *MONTIFRINGILLA NEMORICOLA NEMORICOLA* (Hodgson)

*Fringilauda nemoricola* HODGSON, Asiat. Res., vol. 9, 1836, p. 158 (Nepal).

Two males and two females, Likiang Mountains, 11,000–13,000 feet, April 9–18; three males and one female, Hofuping Mountains, Mekong Valley, November.

The majority of the specimens have the top of the head tawny olive, unstreaked; in one it has faded to isabella color and is being replaced by dark-centered feathers and in another the dark-centered feathers are coming in without much fading in the old feathers. These two specimens were taken in April, but one specimen taken in November has the forehead unstreaked and the occiput streaked. The other two April specimens (male and female) have the crown streaked. According to Sharpe<sup>52</sup> the plain-crowned birds are immature.

<sup>52</sup> Cat. Birds Brit. Mus., vol. 12, 1888, p. 268.

212. *PASSER RUTILANS INTENSIOR* Rothschild

*Passer rutilans intensior* ROTHSCHILD, Bull. Brit. Orn. Club, vol. 43, 1922, p. 11 (Mekong Valley Yunnan).

Eight males and three females from Tengyueh, 5,300 feet, March 7; Yangtze Gorge, 4,600 feet, May 17; between Likiang and Tui-nakou, 9,000 feet, May 18; Likiang Mountains, 10,000–12,000 feet, June and August; Tseh Chung Mountains, November.

213. *HAEMATOSPIZA INDICA* (Gmelin)

*Lowia indica* GMELIN, Sys. Nat., vol. 1, pt. 2, 1789, p. 847 (India).

One female, Likiang Mountains, 11,000 feet, June.

214. *CARPODACUS ERYTHRINUS ROSEATUS* (Hodgson)

*Pyrrhuloxia roseata* HODGSON, Proc. Zool. Soc. Lond., 1845, p. 36 (Nepal).

Two males, five females, and one immature male, Likiang Mountains, 10,000–13,000 feet, May and June; between Likiang and Tui-nakou, 10,000 feet, May 16.

215. *CARPODACUS THURA FEMININUS* Rippon

*Carpodacus femininus* RIPPON, Bull. Brit. Orn. Club., vol. 19, 1906, p. 31 (Yangtze River, W. Yunnan).

A good series of both sexes, Likiang Mountains, 10,000–15,000 feet, April–August; Bayiwua, east of Likiang Mountains, 11,000 feet, June; near Ndagu, 9,600 feet, Yantze Valley, April 28; Hofuping Mountains, Mekong Valley, November; Lapsshan-Yangtze watershed (Lantiölö), February.

This is not a very well-marked race. Three males from Kansu (the type locality of *Carpodacus dubius* Przewalski) are smaller than our Yunnan birds, but birds from western Szechwan are intermediate. They probably will have to be assigned to the northern form, however.

216. *CARPODACUS PULCHERRIMUS PULCHERRIMUS* (Moore)

*Propasser pulcherrima* MOORE, Proc. Zool. Soc. Lond., 1855, p. 216 (Nepal).

One male and three females, Likiang Mountains, 11,000 feet; April 16–17; one female, Lapsshan-Yangtze watershed (Lantiölö), February.

A small series of males from the mountains of western Szechwan are darker above with a pinkish tinge to the plumage lacking in the single Yunnan male; the latter is also more pinkish, not so reddish below, but the Szechwan birds are breeding specimens. The Szechwan series average smaller. The single male listed above looks very much like the plate of *Propasser waltoni* Sharpe in the Ibis (1906, pl. 16), and may belong to that race. Rothschild,<sup>53</sup> however, with more ample material identifies his specimens as of this race.

<sup>53</sup> Nov. Zool., vol. 30, 1923, p. 55.

217. *CARPODACUS VINACEUS* Verreaux

*Carpodacus vinaceus* VERREAUX, Nouv. Arch. Mus. Paris, vol. 6, Bull. 1870, p. 39 (Mountains of Chinese Tibet).

Three females, Likiang Mountains, June and July.

218. *CARPODACUS TRIFASCIATUS* Verreaux

*Carpodacus trifasciatus* VERREAUX, Nouv. Arch. Mus. Paris, vol. 6, Bull. 1870, p. 39 (Mountains of Chinese Tibet).

One fine adult male, Likiang Mountains, 14,000–15,000 feet, April 16.

219. *CARPODACUS RIPPONI* (Sharpe)

*Propasser ripponi* SHARPE, Bull. Brit. Orn. Club, vol. 13, 1902, p. 11 (Gyidzin-shan, W. Yunnan).

Five males and three females, Likiang Mountains, 9,500–12,000 feet, April 23–September; one male, Hofuping Mountains, Mekong Valley, November; one immature unsexed, Tseh Chung Mountains, Mekong Valley, November.

An immature female, an immature male, and the unsexed immature in the above series are darker above, much more brownish below, than the adult female, and the supraauricular stripe is ochraceous, not whitish. The unsexed specimen is particularly dark, but the stripes below are narrower than in the immature marked as a male; it very likely is of the same sex, but slightly older.

220. *PYRRHULA ERITHACA ALTERA* Rippon

*Pyrrhula altera* RIPPON, Bull. Brit. Orn. Club, vol. 19, 1906, p. 19 (Shayang, W. Yunnan).

One male near the Burma border without definite locality, March 25; four males and nine females, Likiang Mountains, 12,000–13,000 feet, May–September.

The male from the Burma border is somewhat smaller, the red below darker and extending up the throat around the black chin spot; it is probably *P. e. erithaca* or an intermediate, but for the present I prefer to list it as above.

An adult male and female recently received from Kansu (120 miles south of Lanchow) are smaller and the female considerably lighter than Yunnan birds; they evidently represent *Pyrrhula erithaca taipaisanensis* Rothschild.<sup>54</sup> The type of *Pyrrhula erithaca wilderi* Riley<sup>55</sup> is darker, especially on the head, and has a smaller bill than the Kansu female.

<sup>54</sup> Nov. Zool., vol. 28, 1921, p. 63.

<sup>55</sup> Proc. Biol. Soc. Wash., vol. 31, 1918, p. 33.

221. *PROPYRRHULA SUBHIMACHALA INTENSIOR* Rothschild

*Propyrrhula subhimachala intensior* ROTHSCHILD, Bull. Brit. Orn. Club, vol. 43, 1922, p. 12 (Likiang Range).

One adult male and one adult female, Likiang Mountains, 13,000–15,000 feet, May 10.

222. *EMBERIZA PUSILLA* Pallas

*Emberiza pusilla* PALLAS, Reise Russ. Reichs, vol. 3, 1776, p. 697 (Daurian Alps).

One adult (not sexed), Huigai, March 11.

223. *EMBERIZA ELEGANS ELEGANTULA* Swinhoe

*Emberiza elegantula* SWINHOE, Proc. Zool. Soc. Lond., 1870, p. 134 (near Kweichow, Hupeh).

One male between Feilung-chiao and Yünlung, March 21; one male, no definite locality, March 26; two males, two females, and two unsexed, Likiang Mountains, 9,400–11,000 feet, May–June; one female, dense forest between Shayang and Nanchu Plain, 9,500 feet, May 30; one male, mountains of Tseh Chung, Mekong Valley, November.

These all belong to one form, apparently. Compared with April specimens of *Emberiza elegans sibirica* Sushkin,<sup>56</sup> from Korea and Chili, the Yunnan series is darker above, especially on the hind neck, where the streaks are black and broad, in one specimen (No. 297507), May 3, almost hiding the slate gray edges to the feathers; the nape more extensively black; the streaks on the flanks blackish rather than russet. In *E. e. sibirica* the hind neck is pale neutral gray, the dark streaks sparse, this difference, without any others, make the two races stand out quite distinctly when viewed from above. I have seen no specimens from Japan. The only specimens available from Hupeh are a winter-taken pair; the male with a smaller wing and tail than the November specimen from Tseh Chung. The latter has darker and broader streaks above; the hind-neck deeper and more extensively gray, and the nape more extensively black. The Hupeh specimens are probably only the northern race.

The National Museum has several breeding birds from Szechwan (Mount Omei, east of Tatsienlu and 25 miles west of Yachow). The Mount Omei specimens are very poor; in fact, the only fair skin is a male from east of Tatsienlu, June 19. It is paler above than the Yunnan series but still much darker than northern birds. A male from Mount Omei and a female from west of Yachow are very dark but very much worn.

<sup>56</sup> Proc. Boston Soc. Nat. Hist., vol. 38, No. 1, 1925, p. 29.

224. *EMBERIZA SPODOCEPHALA MELANOPS* Blyth

*Emberiza melanops* BLYTH, Journ. Asiatic Soc. Bengal, vol. 14, 1845, p. 554 (Tipperah, India).

One male, between Tuinakou, and Likiang, 9,000 feet, May 18; one adult male, Kanhoten, June 3; one immature male, Likiang Plain, 8,200 feet, August 21; one female without locality or date.

225. *EMBERIZA GODLEWSKII YUNNANENSIS* Sharpe

*Emberiza yunnanensis* SHARPE, Bull. Brit. Orn. Club., vol. 13, 1902, p. 12 (Gyi-dzin-shan, W. Yunnan).

A fair series: Between Feilung-chiao and Yünlung, March 21; Likiang Mountains, 9,400–12,000 feet, April 5–May 12; between Likiang and Tuinakou, 10,000 feet, May 16; Yangtze Valley, 4,600 feet, May 17; Likiang Plain, August; mountains above Hungfuping, Mekong Valley, November; Hofuping Mountains, Mekong Valley, November; Yangtze Gorge opposite Funkou, February.

These are considerably darker and richer colored, both above and below, than the more northern race named *Emberiza cia omissa* Rothschild.

An immature male taken in August is molting into the first winter plumage and is almost or quite as dark as the adult; only a few streaks of the immature dress remain on the throat and chest.

226. *EMBERIZA GODLEWSKII OMISSA* Rothschild

*Emberiza cia omissa* ROTHSCCHILD, Nov. Zool., vol. 28, 1921, p. 60 (Si Taipaishan, Tsin-ling Mountains).

One female, Tseh Chung Mountains, Mekong Valley, November; one female, Hofuping Mountains, Mekong Valley, November.

227. *MELOPHUS MELANICTERUS* (Gmelin)

*Fringilla melanictera* GMELIN, Sys. Nat., vol. 1, pt. 2, 1789, p. 910 (Macao).

One male, marked female, between Kantingai and Muanglai, Salwin Valley, March 15; one male, between Wamangai and Tsao Chiang, March 17.

## Family STURNIDAE. Starlings

228. *SPODIOPSAR CINERACEUS* (Temminck)

*Sturnus cineraceus* TEMMINCK, Pl. Col., pl. 556, 1832 (Japan).

One female, without locality or date.

229. *GRACUPICA NIGRICOLLIS* (Paykull)

*Gracula nigracollis* PAYKULL, Kongl. Vetenskaps Acad. Nya Handlingar, vol. 28, 1807, p. 291, pl. 9 (China).

Two males and one female, Tengyueh, 5,300 feet, March 7.

230. *ACRIDOTHERES TRISTIS* (Linnaeus)

*Paradisea tristis* LINNAEUS, Sys. Nat., ed. 12, 1766, p. 167 (Philippine Islands).

One male, Chienchuan, 8,000 feet, June 5; one male and two females, Likiang Plain, 8,200 feet, August; one male, one female, and one juvenile, Likiang Mountains, 10,000 feet, June and August.

The juvenile is apparently just from the nest and was taken in August.

231. *AETHIOPSAR CRISTATELLUS CRISTATELLUS* (Gmelin)

*Gracula cristatella* GMELIN, Sys. Nat., vol. 1, pt. 1, 1788, p. 65 (China).

One male, Tsao Chiang, March 18.

## Family ORIOLIDAE. Orioles

232. *ORIOLUS CHINENSIS TENUIROSTRIS* Blyth

*Oriolus tenuirostris* BLYTH, Jour. Asiatic Soc. Bengal, vol. 15, 1846, p. 48 (Central India).

A good series of adults and immatures from Likiang Mountains, 8,500–14,000 feet, April–September; and Limestone Range east of the Likiang Mountains, 10,000 feet, July.

A young bird not long from the nest was taken July 2.

233. *ORIOLUS TRAILLII TRAILLII* (Vigors)

*Pastor traillii* VIGORS, Proc. Zool. Soc. Lond., 1831, p. 175 (Himalaya, probably Darjiling).

One adult female, Likiang Mountains, June.

When compared with two females from the Himalayas it is not as dark on the head above and lacks the maroon wash to the rump; these differences may be individual or due to age, however, as the two Indian specimens are not alike.

## Family DICRURIDAE. Drongo Shrikes

234. *DICRURUS ATER CATHOECUS* Swinhoe

*Dicrurus cathoecus* SWINHOE, Proc. Zool. Soc. Lond., 1871, p. 377 (China).

One male and three females, Likiang Mountains, 8,200–10,000 feet, April 23, May 15, and September; one female, Chienchuan Plain, June 5.

235. *DICRURUS LEUCOPHAEUS NIGRESCENS* Oates

*Dicrurus nigrescens* OATES, in Hume's Nests and Eggs, ed. 2, vol. 1, 1889, p. 208 (Rangoon).

A good series from: Likiang Mountains, 8,200–10,000 feet, April 5, June–August; Yangtze Gorge near Tsilikiang, 4,600 feet, May 17; between Nguluko and Yulo, Yangtze Valley, May 24; Chienchuan plain, 8,000 feet, June 5.

The only specimen from Assam, a female (*Dicrurus leucophaeus hopwoodi*), available for comparison is a much darker bird both above and below than any in the Yunnan series. Six males in the series have a wing, 143-157 (147.5); and five females, 145-152.5 (148). Bangs<sup>57</sup> assigns three males from the same general region to *Dicrurus leucophaeus nigrescens*, but remarks that they are large birds. Rothschild<sup>58</sup> also assigns specimens from northern Yunnan to this race. The wing is considerably greater than that given by Stuart Baker,<sup>59</sup> however.

### Family CORVIDAE. Crows, Jays, etc.

#### 236. CORVUS MACRORHYNCHOS INTERMEDIUS Adams

*Corvus intermedius* ADAMS, Proc. Zool. Soc. Lond., 1859, p. 171 (Kaschmir Dogshai, and Simla).

One adult (unsexed but probably a male), Likiang Mountains, 12,000 feet, April 16; one adult male, Hofuping Mountains, Mekong Valley, November.

These have been compared with five males and four females from Kashmir, and while they have slightly larger bills, 58 against 56-57.5 (56.7), the differences are hardly enough to warrant subspecific separation.

*Corvus macrorhynchos tibetosinensis* Kleinschmidt and Weigold<sup>60</sup> and *Corvus coronoides mengtszensis* La Touche<sup>61</sup> are synonyms.

#### 237. CORVUS CORONE YUNNANENSIS La Touche

*Corvus corone yunnanensis* LA TOUCHE, Bull. Brit. Orn. Club, vol. 43, 1922, p. 43 (Mengtze, S. E. Yunnan).

One adult male, Yangtze, Mekong Valley, November.

#### 238. COLOEUS DAURICUS KHAMENSIS Bianchi

*Coloeus dauricus khamensis* BIANCHI, Bull. Brit. Orn. Club, vol. 16, 1906, p. 68 (Mekong R., Kham, S. E. Tibet).

One male and one female, Kanhoten, March 28; one female, Likiang Mountains, 9,800 feet, May 5; one male, Yangtze Gorge, 4,600 feet, May 17; one male, near Chinho, May 29; one female, without definite data.

#### 239. COLOEUS NEGLECTUS (Schlegel)

*Corvus neglectus* SCHLEGEL, Bijdr. Dierk. Amsterdam, Afl. 8, Corvus, 1859, p. 16 (Japan).

One immature female, Chienchuan, 8,000 feet, June 5; one adult male, Tseh Chung Mountains, Mekong Valley, November.

<sup>57</sup> Bull. Amer. Mus. Nat. Hist., vol. 44, 1921, p. 598.

<sup>58</sup> Nov. Zool., vol. 28, 1921, p. 65; vol. 30, 1923, pp. 57, 266.

<sup>59</sup> Fauna Brit. India, Birds, ed. 2, vol. 2, 1924, p. 361.

<sup>60</sup> Abh. u. Ber. d. Zool. u. Anthr.-Ethn. Mus. Dresden, vol. 15, 1922, p. 2.

<sup>61</sup> Bull. Brit. Orn. Club, vol. 43, 1923, p. 80.

240. *NUCIFRAGA CARYOCATACTES MACELLA* Thayer and Bangs

*Nucifraga hemispila macella* THAYER and BANGS, Bull. Mus. Comp. Zool., vol. 52, 1909, p. 140 (Hsien-shan-hsien, Hupeh).

One male, between Heshwe and Lusuko, 11,000 feet, April 27; one adult unsexed and one immature, Heshwe, 10,000 feet, May 2; eight adults (four males, three females, and one unsexed), and one immature female, Likiang Mountains, 10,000–11,000 feet, May–September.

Two adults from the mountains of western Szechwan agree with the Yunnan series.

Three adults (only one sexed) from the mountains of Shansi are browner, the dark color of the pileum does not extend so far onto the mantle, the spots above and below are slightly heavier than in the Yunnan birds. They represent *Nucifraga hemispila interdictus* Kleinschmidt and Weigold.<sup>62</sup>

Both Bangs<sup>63</sup> and Kleinschmidt and Weigold<sup>64</sup> have relegated *Nucifraga yunnanensis* Ingram<sup>65</sup> to the synonymy of *Nucifraga hemispila macella* Thayer and Bangs.<sup>66</sup>

The two immature specimens referred to above taken May 2 and June have the throats buffy white and the upper and lower parts, except the rump and under tail coverts, heavily spotted with isabella color. The May specimen is considerably younger and has a rather short bill and the spots larger and heavier.

241. *UROCISSA MELANOCEPHALA MELANOCEPHALA* (Latham)

*Coracias melanocephala* LATHAM, Ind. Orn., vol. 1, 1790, p. 173 (China).

Ten adults (five males, three females, and two unsexed), Likiang Mountains, 8,200–11,000 feet, April–June and September; one male, Yangtze Gorge, 7,000 feet, May 22; one male, mountains near Yangtze, Mekong Valley, November; one female, Litang Valley, below Mili, 8,000 feet, February.

The above series when compared with a series from northern and central China averages a much deeper and purer blue on the upper parts, and the tail is considerably longer.

242. *UROCISSA FLAVIROSTRIS FLAVIROSTRIS* (Blyth)

*Psilorhinus flavirostris* BLYTH, Journ. Asiatic Soc. Bengal, vol. 15, 1846, p. 28 (Darjeeling).

One male, Hofuping Mountains, Mekong Valley, November.

This appears to be the first record of this species from China. The specimen differs widely from four adults from Kashmir (*Urocissa*

<sup>62</sup> Falco, vol. 18, 1922, p. 2; Abh. u. Ber. d. Zool. u. Anthr.-Ethn. Mus. Dresden, vol. 15, 1922, p. 5.

<sup>63</sup> Bull. Amer. Mus. Nat. Hist., vol. 44, 1921, p. 599.

<sup>64</sup> Abh. u. Ber. d. Zool. u. Anthr.-Ethn. Mus. Dresden, vol. 15, 1922, p. 5.

<sup>65</sup> Bull. Brit. Orn. Club, vol. 25, 1910, p. 86.

<sup>66</sup> Bull. Mus. Comp. Zool., vol. 52, 1909, p. 140.



*flavirostris cucullata*. The blue of the wings and tail externally is much darker and more purplish; the back of an entirely different color, dark olive-buff with a dark madder blue sheen, and blue hardly showing in certain lights and the olive-buff almost disappearing in others; the lining of the wings and tail is olive-ocher; tips to the tail feathers, pinkish-buff; and there are other differences.

Sharpe,<sup>87</sup> however, evidently had similar specimens from Kashmir which he considered to be in immature plumages. The above Yunnan specimen appears to be adult, but if not, it would be rather unique for the immature of a species of *Corvidae* to have a distinctive first winter plumage.

243. *GARRULUS BISPECULARIS SINENSIS* Swinhoe

*Garrulus sinensis* SWINHÖE, Proc. Zool. Soc. Lond., 1863, p. 304 (Canton to Ningpo).

Two males and one female, Likiang Mountains, July; one female, Ashi Road, banks of Yangtze, July; one male, Litiping Mountains, Yangtze Divide, November; one female and one unsexed, Hofuping Mountains, Mekong Valley, November; one male and one female, forests of Mili, southwest Szechwan, February.

This series when compared with Fukien birds averages grayer on the mantle and a little more rufescent on the head. The differences are slight and inconstant, and hardly warrant recognition by name.

244. *PYRRHOCORAX PYRRHOCORAX HIMALAYANUS* (Gould)

*Fregilus himalayanus* GOULD, Proc. Zool. Soc. Lond., 1862, p. 125 (Himalayas).

Three adult males and four unsexed adults, Likiang Mountains, 9,800–11,000 feet, April, August, and September.

The United States National Museum contains a good series of the chough from western Szechwan, a small series from Kansu and Inner Mongolia, a small series from Kashmir, but few from Europe.

The series from Yunnan and western Szechwan seem to be the same and are uniformly larger with much larger bills than the European bird. Kansu and Inner Mongolian specimens are smaller with smaller bills than Yunnan birds and belong to *Pyrrhonorax p. brachypus* Swinhoe.

The Kashmir bird is smaller than *P. p. himalayanus*, but somewhat larger than Kansu specimens, the differences are slight and for the present they may be assigned to *Pyrrhonorax p. brachypus* rather than *Pyrrhonorax p. pyrrhonorax*, which is a somewhat smaller race.

<sup>87</sup> Cat. Birds Brit. Mus., vol. 3, 1877, p. 73.

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# NEMATODE EGGS FROM THE GILL REGION OF A SHARK, *CARCHARHINUS MILBERTI*

By G. A. MACCALLUM  
Of Baltimore, Maryland

On August 29, 1925, we examined at the United States Bureau of Fisheries Commission at Woods Hole, a large shark, *Carcharhinus milberti*, which is sometimes called great blue shark, dusky shark, etc. There were found on the gill arches or attachment of the gills to the cavity of the throat some quite large black patches on the mucous membrane. On further careful examination these proved to be deposits of eggs very like those found the year previous on the under surface of the nose of a *Carcharhinus commersonii* and reported by MacCallum (1925). The eggs appeared to the naked eye similar to those previously reported by MacCallum, although their location was different and they were laid in a different manner. These were in very considerable patches, sometimes as much as two inches long by half an inch wide or wider, and hence quite different from those reported from a shark last year by MacCallum, the latter eggs being in almost mathematically correct squares between the scales and if laid on the edges of the fins they were found to be under the outer layer of the skin. On closer examination of those seen on *Carcharhinus milberti* they were found to be covered with spines (fig. 1), not very closely placed, and visible only under a high magnification. In other respects than this they were of about the same size, color, and shape as those previously reported by MacCallum. Those described here are  $110\mu$  by  $60\mu$ . Apparently they might belong to the same genus, although evidently of a different species at least, and they may be tentatively referred to the genus *Capillaria*. As in the case of those eggs found on *C. commersonii* no adult worms were found. By placing a few clean eggs between two cover

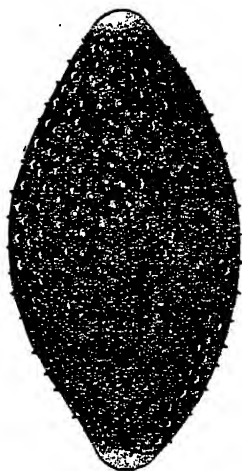


FIG. 1.—EGGS OF *CAPILLARIA SPINOSA*?



slips, or on a slide with cover slip, and using such pressure as was necessary to crush the ripe eggs, a procedure which required more force than we had expected, several embryos were forced from their shells. These were rather blunt and had smaller tails than the embryos from eggs on *C. commersonii*. They were quite different from the free-living nematodes which are often found with them and which are larger, very active, and have a sharp tail. These latter are often seen in the fluid containing an amount of mucus and other débris from this shark and belong to the genus *Monhystera*.

As the worm eggs described here are from the membranous mucous covering of the connective tissue of the gill arches of *C. milberti* and as the egg shells are spiny, they are regarded as a distinct species. This species I propose to call *Capillaria spinosa*.

In looking for the spiny eggs we discovered eggs of another form. They are spherical, of a light grayish color, and contain a coiled embryo. The embryo appears to be granular as seen through the shell; when extruded from the shell it is sluggish and is somewhat granular throughout its whole length. We have never seen it lively or seeking around for food, as is often the case with nematodes. These eggs are very difficult to mount. This egg does not seem to have been noticed hitherto. The adult worms were not seen. The eggs are about  $100\mu$  in diameter and almost always are solitary, although as many as two or three may often be seen in the field of the microscope at the same time. Owing to the entire lack of a recognizable character about these eggs on which to refer them to a known nematode group, no name is attached to them here.

I may say that the accompanying illustration, which has been made in Dr. N. A. Cobb's department, is quite true to nature and meets with my approval.

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MACCALLUM, G. A.

1925. Eggs of a new species of nematoid worm from a shark, Proc. U. S. Nat. Mus., Wash., vol. 67, art. 16, pp. 1-2, pl. 1, figs. 1-3.



# NOTES ON CESTODE PARASITES OF BIRDS

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The material upon which these notes are based was, for the most part, collected in the region about Woods Hole, Massachusetts, by the late Vinal N. Edwards. As a rule it was preserved either in formalin or alcohol without the employment of any special killing fluids. Consequently the whole mounts and sectioned material, while as satisfactory as could be expected, do not always reveal as many details of structure as could be desired.

It had been hoped that an examination of the fish-eating birds would supply some stages in the life histories of helminth parasites common to birds and fishes. This hope was not realized in the case of the cestode parasites.

Following is a list of the parasites considered in these notes with their hosts:

PARASITE	HOST
<i>Ligula intestinalis</i> (Linnaeus)-----	<i>Colymbus holboellii</i> . <i>Podilymbus podiceps</i> .
<i>Schistocephalus solidus</i> (O. F. Müller)	<i>Podilymbus podiceps</i> .
<i>Tetrabothrius cylindraceus</i> (Rudolphi)-----	<i>Sterna dougalli</i> . <i>hirundo</i> . <i>Larus argentatus</i> . <i>atricilla</i> . <i>marinus</i> .
<i>Tetrabothrius heteroclitus</i> (Diesing)-	<i>Nycticorax nycticorax naevius</i> . <i>Puffinus borealis</i> . <i>gravis</i> . <i>griseus</i> .
<i>Tetrabothrius macrocephalus</i> (Rudolphi)-----	<i>Colymbus auritus</i> . <i>holboellii</i> . <i>Gavia immer</i> .
<i>Tetrabothrius sulcatus</i> , new species---	<i>Fregata magnificens</i> .
<i>Ophriocotyle proteus</i> Fries-----	<i>Larus argentatus</i> . <i>atricilla</i> .

<i>Dilepis unilateralis</i> (Rudolphi)-----	<i>Butorides virescens.</i>
<i>Choanotaenia parina</i> (Dujardin)-----	<i>Passer domesticus.</i>
<i>Choanotaenia ransomi</i> , new species----	<i>Gavia immer.</i>
	<i>Larus argentatus.</i>
	<i>atricilla.</i>
	<i>delawarensis.</i>
	<i>philadelphia.</i>
<i>Choanotaenia</i> , species-----	<i>Larus argentatus.</i>
<i>Hymenolepis anceps</i> , new species-----	<i>Mergus serrator.</i>
<i>Hymenolepis ardeae</i> Fuhrmann-----	<i>Butorides virescens.</i>
<i>Hymenolepis coronula</i> Fuhrmann-----	<i>Glaucionetta clangula americana.</i>
	<i>Oidemia perspicillata.</i>
<i>Hymenolepis ductilis</i> , new species-----	<i>Larus argentatus.</i>
	<i>marinus.</i>
<i>Hymenolepis fusus</i> (Krahb)-----	<i>Larus argentatus.</i>
<i>Hymenolepis hamulacanthos</i> new species-----	<i>Marila americana.</i>
<i>Hymenolepis macracanthos</i> (Linstow)-----	<i>Mergus serrator.</i>
<i>Hymenolepis pachycephala</i> (Linstow)-----	<i>Colymbus holboelli.</i>
<i>Hymenolepis podicipina</i> Szymanski-----	<i>Colymbus auritus.</i>
	<i>holboelli.</i>
<i>Hymenolepis rostellata</i> (Abilgaard)-----	<i>Colymbus holboelli.</i>
	<i>Gavia immer.</i>
<i>Hymenolepis tritesticulata</i> Fuhrmann-----	<i>Fulica americana.</i>
	<i>Marila marila.</i>
	<i>Mergus serrator.</i>
	<i>Oidemia deglandi.</i>
	<i>perspicillata.</i>
<i>Hymenolepis</i> (Weinlandia), species-----	<i>Marila marila.</i>
	<i>Oidemia deglandi.</i>
<i>Hymenolepis</i> , species-----	<i>Larus delawarensis.</i>
<i>Hymenolepis</i> , species-----	<i>Fulica americana.</i>
<i>Rhabdometra similis</i> Ransom-----	<i>Coccyzus americanus.</i>
<i>Diorchis acuminata</i> Clerc-----	<i>Marila americana.</i>
<i>Valipora mutabilis</i> , new species-----	<i>Nycticorax nycticorax naevius.</i>
<i>Valipora parvispine</i> , new species-----	<i>Gavia immer.</i>
<i>Dioicocestus fuhrmanni</i> Linton-----	<i>Colymbus auritus.</i>
	<i>holboelli.</i>
<i>Diploposthe laevis</i> (Bloch)-----	<i>Marila americana.</i>
<i>Gyrocoelia milligani</i> , new species-----	<i>Crocethia alba.</i>
<i>Fimbriaria fasciolaris</i> (Pallas)-----	<i>Mergus serrator.</i>
	<i>Oidemia deglandi.</i>
<i>Fimbriaria falciformis</i> , new species-----	<i>Fulica americana.</i>
	<i>Clangula hyemalis.</i>
	<i>Oidemia deglandi.</i>
	<i>perspicillata.</i>

## FOOD NOTES

On account of their possible service in suggesting lines of inquiry concerning life histories of the cestodes which are described in this paper the following brief summary of food notes is given:

*Butorides virescens:*

July, August, and September.—Small fish (*Fundulus*), on 5 dates; insects, 3 dates.

*Coccyzus americanus:*

June.—Stomach of one bird contained 20 caterpillars and fragments of beetles.

*Colymbus auritus:*

January, February, March, April, November, and December.—Fish (*Fundulus*, silversides, sculpins), 5 dates; Nereis, 2 dates; shrimp, 1 date.

*Colymbus holboellii:*

January, February, March, April, November, and December.—Fish (cunners, sculpins, silversides), 14 dates; Nereis, 3 dates; amphipods, crabs, and shrimp, 1 date.

*Fulica americana:*

November.—Mussels, 2 dates.

*Gavia immer:*

January, February, April, July, and December.—Fish (cunners, menhaden, sculpins, silversides), 11 dates.

*Larus argentatus:*

January, February, March, April, May, June, August, September, November, and December.—Fish (alewives, cunners, herring, sand eels, sculpins, silversides), 12 dates; crabs, 4 dates; starfish, 2 dates; mussels, 9 dates; garbage, 14 dates.

*Larus atricilla:*

April, May, July, August, and September.—Fish (pipe fish, pollock, silversides, young herring), 10 dates; insects, 3 dates; small mollusks, 1 date; small crustaceans, 1 date.

July 3.—One stomach contained 66 wasps, 1 beetle, and many fragments of insects.

July 30.—Approximately 300 isopods (*Idotea*) and small crabs 4 mm. in breadth, were found in the stomach of one gull.

*Larus delawarensis:*

January.—Crabs and gravel.

*Larus marinus:*

January.—Crabs, 1 date; mussels, 1 date.

April.—Fish (cunners), 1 date.

*Larus philadelphica:*

November.—Fish (sand eels, silversides), 6 dates; shrimp, 1 date; small crustaceans (*Mysis*), 1 date (number in vial, 1,670).

April.—Copepods, 1 date.

*Marila americana:*

February.—Mollusks, *Ulva*, and eel grass, 1 date.

*Marila marila:*

January and February.—Small mollusks, on 5 dates; eel grass and *Ulva*, 1 date.

*Mergus serrator:*

January, February, April, and November.—Fish (cunners, pholas, sculpins (eggs), silversides, stickleback, tautog), 18 dates; mussels, 1 date.

*Nycticorax nycticorax, naevius:*

May, July, and September.—Fish (*Fundulus*, silversides, whitening, from fish pound), 12 dates.

*Oidemia deglandi:*

February, June, July, August, September, October, and November.—Bivalve mollusks (*Mytilus*, *Venus*, *Yoldia*), 8 dates; gastropod mollusk shells, some containing hermit crabs, 2 dates.

October 18.—Two birds examined; one contained 736 (estimated) small clams (*Venus*), 3 to 7 mm. in length; the other contained 728 (estimated) of the same, 3 to 8 mm. in length.

*Oidemia perspicillata:*

February, May, and July.—Small bivalve mollusks, 3 dates; univalve mollusks, 1 date.

*Podilymbus podiceps:*

November.—Feathers and down, 2 dates.

*Puffinus borealis:*

August.—Fish and squid, 1 date.

*Sterna dougalli:*

August.—Fish, 1 date.

*Sterna hirundo:*

August and November.—Fish (*Fundulus*, silversides), 3 dates; squid, 1 date; insects (Hymenoptera), 1 date.

The greater part of the work of the preparation of this report was done at the medical department of the University of Georgia, Augusta, Georgia.

## LIGULA INTESTINALIS (Linnaeus)

## Figures 1-4

There are considerable differences exhibited by the outlines of the anterior ends of strobiles. Two types of these are shown in figures 1, 2; the one elongated and sharp-pointed, the other bluntly rounded. There is a superficial segmentation of the strobile, but only at the anterior end. Thus in a mounted specimen measuring about 56 mm. in length segments occur only on the anterior 12 mm., where there are 38 distinct proglottides. They cease abruptly, the succeeding part of the strobile being transversely rugose, but without any indi-

cation of proglottides further than is shown by the successive sets of reproductive organs. Rudiments of these may be seen about 3.5 mm. from the anterior end; ova make their appearance 10 mm. or less from the anterior end. At the distance of about 20 mm. from the anterior end the sets of reproductive organs are about 0.15 mm. apart. Toward the posterior end four sets of reproductive organs occupied a length of strobile of only 0.63 mm.; near the posterior end three sets, now represented by egg-masses, took up 0.92 mm. of length. In another strobile three egg clusters occupied a length of 2.10 mm.

The anatomy, as revealed by several series of sections, agrees with that given by various authors. A diagrammatic representation of the genitalia reconstructed from a series of transverse sections is given in Figure 4.

In a transverse section made 1 mm. from the anterior end the thickness of the cuticle is 0.02 mm., subcuticula 0.14, longitudinal muscle layer 0.11, circular muscle layer 0.11, medulla 0.14. The subcuticula consists of a dense layer of radial fibers with numerous fine longitudinal fibers interspersed. At the edge of the subcuticula, next the layer of longitudinal muscles, there is a layer of nuclei deeply stained, which represents the rudiments of the vitellaria. The longitudinal fibers of the cuticula are in clusters and appear to be very small fascicles of fine longitudinal muscles. The bundles of longitudinal muscles in transverse section are much elongated radially, and the individual fibers are closely crowded and numerous. The layer of circular muscles is here strongly developed, being of about the same thickness as the longitudinal layer. The medulla is narrow, a little less than one-sixth the thickness of the strobile at this point. The structure of the adult strobile differs from the foregoing principally in the space occupied by the vitellaria, which lies between the subcuticula and the layer of longitudinal muscles. Thus in a transverse section 3.36 by 0.70, at a point where the thickness of the strobile was about 0.60, the thickness of the cuticle was 0.009, the subcuticula 0.07, the vitelline layer 0.07, the longitudinal muscle layer 0.08, the circular muscle layer 0.03, and the thickness of the medulla 0.10. The longer diameter of the testes is dorso-ventral and is about equal to the thickness of the medulla. At this level the fibers of both longitudinal and circular muscles are coarser than they are near the anterior end of the strobile. The medulla is crossed by numerous rather strong dorso-ventral fibers which can be traced across the circular muscles and between the bundles of the longitudinal layer.

The ova varied in greater diameter from 0.057 to 0.069, and in lesser diameter from 0.036 to 0.042; average of fourteen 0.061 by 0.039.

## RECORD OF COLLECTIONS

*Colymbus holboellii*, new host:

1910, April 17.—2, flat, thin, tapering to the posterior end, where the breadth was 2 mm.; length of one 72 mm., maximum breadth 6; length of the other 116, maximum breadth 7.

*Podilymbus podiceps*:

1903, November 13.—5, from 40 to 115 mm., in formalin. In all but one the maximum breadth was 4 mm., in one it was 6 mm.

(U.S.N.M., Helm. Coll. 7859.)

## SCHISTOCEPHALUS SOLIDUS (O. F. Müller)

Figure 5

A single strobile was found in a lot of cestodes collected by Mr. Edwards November 13, 1903, at Woods Hole from the pied-billed grebe (*Podilymbus podiceps*), new host. The specimen was associated with several strobiles of *Ligula intestinalis*, and was not recognized until after it had been mounted in balsam. It is 60 mm. in length, fusiform, tapering more posteriorly than anteriorly, the greatest breadth being at a point a little in front of the middle. Breadth of scolex and anterior segments, measured on their posterior margins, 1 mm., 1.12, 1.40, 1.96, 2.10, 2.21, 2.49; length from 0.42 to 0.56; number of proglottides in the strobile, 94. Lateral margins of strobile serrate. At the broadest part of the strobile the proglottides measured 0.60 mm. in length and 3.64 in breadth. Near the posterior end the proglottides were somewhat crumpled and measurements were not satisfactory, but the length and breadth are about equal, and about 1 mm.

Rudiments of a cirrus first appear in the eleventh proglottis; a few clusters of cells with somewhat irregular outlines appear in the ninth proglottis and continue for about five proglottides which may represent the testes. In the twelfth, thirteenth, and fourteenth proglottides the cirrus, cirrus-pouch, testes, ovary, vitellaria, and rudiments of the uterus could be seen. In the fifteenth proglottis the uterus was filled with a compact mass of ova, not differing materially in size nor in apparent number of ova from similar masses in the 79 proglottides which succeeded it. This mass of ova in the fifteenth proglottis measured 0.35 mm. in length and 0.56 in breadth. It should be remarked that although the full complement of ova had appeared in the fifteenth proglottis, none had yet been formed in the fourteenth. Ova seen in position to give the maximum section are 0.075 by 0.045; an average of 12 ova taken at random was 0.071 by 0.043. The diameter of the cirrus-pouch was about 0.12.

(U.S.N.M., Helm. Coll. 7860.)

**Genus TETRABOTHRIUS Rudolphi**

For synonymy see Ransom's Taenioid Cestodes of North American Birds, Bull. 69, U. S. Nat. Mus., 1909.

Scolex provided with four prominent suckers in dorso-ventral pairs, and with a characteristic cap-like appendage at the anterior end. Proglottides begin near the scolex, and, as a rule, are much broader than long. The genital pores are unilateral, each consisting of a strong muscular cloaca into which the cirrus and vagina open. The cirrus-pouch is small, much smaller than the cloaca, on the inner border of which it lies. The vitelline gland lies in front of the ovary.

**TETRABOTHRIUS CYLINDRACEUS (Rudolphi)**

Figures 6-13.

Cestodes in the collection from two species of tern and three species of gull, belonging to the genus *Tetrabothrius*, while exhibiting considerable difference in the appearance of the strobiles, agree in so many respects that the best disposal of them seems to be to place them in the same species. Further details are given under each specific host. Differences in the structure of the scoleces were slight, although there were considerable differences in size. The genital pore in adult proglottides was at about the middle of the length, or a little anterior to the middle, and nearly on the margin. The diameter of the cirrus-pouch was nearly the same in all, and the relation between the vagina and cirrus at the point of entry into the cloaca was the same in all. The number of testes, which surround the ovary, appeared to be about the same in all. The number of fibers in the bundles of longitudinal muscles did not furnish a reliable specific character, since the number of fibers differs in different regions of the strobile, and in different parts of the same section. In all of the sections there is close agreement in the nature of the longitudinal muscles. In all cases there are two quite distinct layers, an inner layer of relatively large bundles, with 25 fibers, more or less, in each, and an outer layer consisting of a greater number of bundles than are found in the inner layer, but with from 3 to 7 fibers in each. Mature ova were seen only in sections of material from the tern. They were surrounded by thin, membranous envelopes.

From *Sterna hirundo*, new host:

Appendage of scolex moderately developed; length of scolex, 0.24; breadth, anterior, 0.24; posterior, 0.32, in balsam.

Maximum length of strobile 55 mm.; posterior segments, length 1, breadth 2; margins of strobile rather sharply serrate, except in



middle portion, where the proglottides are very short with bluntly rounded margins; first distinct segments about 3 mm. back of scolex. The short cirrus opens beside the vagina on a papilla in the muscular genital cloaca. The cirrus-pouch varies slightly in size and shape in different sections. In a series of frontal sections it was about 0.05 mm. in length and 0.04 in diameter. The folds of the vas deferens lie on the dorsal side of the medullary space between the cirrus-pouch and the median line. The exact number of testes was not indicated in whole mounts, but, as seen in sections, appears to be 20 or more. The vagina passes, from its opening beside the cirrus, at first ventrad, then medio-dorsad, enlarging in its course into an elongated seminal receptacle. The ovary, as seen in frontal sections, consists of two lobulate masses symmetrically placed on each side of the median line, where they unite. The vitelline gland is small, lobed, and lies on the median line in front of the ovary and on the ventral side of the medullary space. In a mature but unripe proglottis the vitelline gland was 0.056 mm. in length and 0.056 in breadth; the ovary in the same proglottis measured 0.126 in length and 0.322 in breadth. Rudiments of the uterus were seen leading from the shell gland, and, in proglottides in which ova had begun to appear, the uterus lay on the dorsal side of the ovary; in mature proglottides it is profoundly lobed. Later the lobed condition gives way to a more or less even outline, when the uterus occupies practically all of the medullary space. Ova with six-hooked embryos were seen in the ripe proglottides. They have three membranous envelopes, and are about 0.045 mm. in diameter. In sections of adult, but unripe, proglottides the inner longitudinal muscle bundles contain from 12 to 27, or more, fibers; and the outer from 3 to 7, or more. The circular layer, next within the inner longitudinal layer and surrounding the medullary space, is rather distinct. The ventral excretory vessels are much larger than the dorsal.

This form from the tern has rather more distinct divisions of the strobile into proglottides than is the case with those from the gulls. Indeed there are some suggestions in the anatomy of Fuhrmann's species *T. sarisini*, from a tern of New Caledonia.

From *Larus atricilla*:

The bothria are long-oval, with rather strong muscular border, the capitate appendage is moderately developed. There is a short, unsegmented neck; the first proglottides are much broader than long, and the margins of the strobile are bluntly serrate. The proglottides increase rather uniformly in breadth but very slowly in length. The following dimensions are fairly typical: Length 52 mm.; maximum breadth 2.5; breadth of proglottis 5 mm. back

of scolex 0.16, length 0.07; 10 mm. back, breadth 0.35, length 0.14; 20 mm. back of scolex, breadth 0.72, length 0.12; 30 mm. back, breadth 1.54, length 0.17; 40 mm. back, breadth 1.90, length 0.17. The anatomy of the proglottides is in close agreement with that already given.

From *Larus marinus*:

Material not in good condition, but so far as the anatomy is shown it is in agreement with the foregoing; for example, the diameter of the cirrus-pouch is about 0.045 mm., and details of the structure of the genital cloaca, as shown in sections, agree with what was observed in sections of material from other gulls.

From *Larus argentatus*:

The scoleces differ more or less in shape, due to different contraction conditions, but not so much in size. Thus a considerable number of scoleces mounted in balsam do not vary much from 0.24 mm. in length and breadth. The capitulate appendage is moderately well developed, although in some of the mounted scoleces it appears to be rather meager. Diameter of cirrus-pouch 0.045 mm.; number of testes about 22; details of structure of genital cloaca, ovary, vitelline gland, musculature, etc., agree with foregoing descriptions.

#### RECORD OF COLLECTIONS

*Sterna hirundo*:

1904, August 3.—Anterior end of strobile, length 7.5 mm.; scolex missing.

1912, August 2.—Three fragments, aggregating 35 mm.

1912, August 17.—One, length 135 mm.

1913, September 4.—Two, length 145 and 155 mm.

*Sterna dougalli*:

1904, August 3.—Six fragments of strobile, aggregating 18 mm.

*Larus atricilla*:

1911, September 9.—One scolex and fragments of strobile.

1913, August 4.—One, length 52 mm., and fragment. U.S.N.M., (Helm. Coll. 7861.)

3 mm.; 1, scolex somewhat macerated, length 38 mm.

1915, May 27.—Two, one with scolex; length 55 mm.

*Larus marinus*:

1904, January 19.—Four; dimensions of one: Length 130 mm.; diameter of scolex, anterior 0.45, posterior 0.40; length of scolex 0.40. One strobile in this lot, scolex missing, measured 250 mm. in length and 2.5 in greatest breadth.

1911, January 10.—Strobile and fragments aggregating a length of 220 mm.

1914, April 28.—One.

*Larus argentatus:*

This species was collected at Woods Hole on many dates in all except two months of the year.

January.—On seven dates in three different years; few found on any date; in most cases the scoleces were missing; maximum length 40 mm.

February.—On eight dates in four different years; largest number found on any date 30; maximum length 100 mm. On one date the record is "many, 15 with scoleces."

March.—On one date; 3 fragments; maximum length 85 mm.; no scoleces.

April.—On six dates in four different years; largest number with scoleces found on any date 7; maximum length 220 mm.

May.—On three dates in two different years; largest number found on any date 18; maximum length 150 mm., maximum breadth 3.

July.—One date; six strobiles with scoleces, and about 12 scoleces with only anterior portion of strobile attached; numerous strobiles without scoleces.

September.—One date; eight, four with scoleces; many fragments.

October.—One date; three strobiles, no scoleces.

November.—On four dates in three different years; one on each of three of the dates. On the other date the record is: "Many strobiles without scoleces; 2 scoleces; breadth of strobile 2 mm."; maximum length 160.

December.—On four dates in three different years; greatest number on any date 4; maximum length 70 mm., breadth 2.

**TETRABOTHRIUS HETEROCLITUS (Diesing)**

## Figures 14-22

Cestodes of this genus, collected from three species of shearwater, and the night heron, as was the case in cestodes of the same genus from gulls and divers, exhibit much variability in size of strobiles and in the shape of the proglottides. Some diversity also exists in the scoleces.

*Scolex*.—Bothria oval-elliptical, with relatively thick, muscular borders; appendage appearing rather weak, but in well-preserved specimens seen to be fairly well developed. The majority of the scoleces in balsam have a length and breadth of about 0.35 mm. Thus 22 scoleces averaged 0.37 in length and breadth; 12 of the 22 measured 0.35 by 0.35. A few scoleces were seen which were larger; length 0.75, breadth 0.72, and, one much smaller, length and breadth 0.21.

*Strobile*.—The larger strobiles are subcylindrical, with short proglottides, beginning near the scolex, and increasing in length and breadth gradually and uniformly, the posterior proglottides about one-fourth as long as broad; lateral margins of strobile bluntly serrate. In other and smaller strobiles there is great variety in the shape of the proglottides. For example, in some the proglottides begin near the scolex as closely set transverse striae, which continue for a short distance; first distinct proglottides closely crowded together, margins of the strobile bluntly serrate. Then the proglottides begin to lengthen rather rapidly, soon becoming as long as broad, with prominent, slightly thickened posterior borders; toward the posterior end they may again become shorter and crowded together. Other proglottides are slender and have distinct proglottides throughout the entire length. The largest specimen in the collection, from *P. stricklandi*, measures about 100 mm. in length, 2.5 in greatest breadth, and 1.5 in thickness; posterior, ripe proglottides, length 0.6, breadth 2.5. The cirrus is short, and opens on a papilla in the genital cloaca. The cirrus-pouch does not vary greatly from a diameter of 0.045; the largest diameter noted was 0.057, the smallest 0.028 by 0.037. The voluminous vas deferens lies on the dorsal side of the medullary space. The testes surround the ovary and vitelline gland, and rudimentary uterus. Their number was not satisfactorily shown, except in young, campanulate proglottides, where there appeared to be from 20 to 25, or more. The vagina opens into the genital cloaca on the ventral side of the cirrus papilla. It is sinuous at first, then expands slightly into an elongated seminal receptacle. The vitelline gland is anterior to the ovary on the dorsal side, and is slightly lobed. The ovary is profoundly lobed. The uterus, in ripening proglottides, is lobed, the lobes becoming less distinct as the proglottides grow older. The number of fibers in the muscular bundles is variable. Thus in the section of a ripe proglottis, breadth 1.33, thickness 0.91, the maximum number of fibers in the inner bundles was about 22, in the outer 12. In another, the number of fibers in the inner bundles varied from 6 to 22, in the outer from 3 to 8. In another the maximum number of fibers in the inner bundles was 16, more or less, in the outer 12, more or less. The outer layer becomes subcuticular for a short distance at the anterior end of the proglottis.

## RECORD OF COLLECTIONS

*Puffinus borealis*, new host:

1906, June 11.—Four birds examined by Mr. Edwards, who recorded: "Worms very numerous." There is a considerable variety in size in this lot. Some very small moniliform strobiles were noted, which subsequent examination showed to be

constricted rather uniformly near the scolex, several incipient proglottides being included in the bead-like portion included between two adjacent constrictions.

1913, August 5.—Five strobiles, 3 with scoleces, about 30 mm. in length and 1 mm. in breadth; also 3 very small scoleces and fragments of both larger and smaller strobiles.

U. S. N. M., Helm, Coll. 7862.

*Puffinus gravis*, new host:

1904, October 31.—Eight strobiles with scoleces, and about 25 without scoleces; maximum length, in alcohol, 70 mm.

*Puffinus griseus*, new host:

1906, June 8.—Six birds examined by Mr. Edwards; few cestodes; great difference in size, but most of them large. Dimensions of one, in formalin: Length 80 mm.; greatest breadth 2.5, thickness 1.5.

1906, June 11.—Six birds examined; cestodes of smaller size than those collected on June 8.

*Nycticorax nycticorax naevius*, new host:

1913, July 5.—One small strobile, macerated, and a few fragments, longest 16 mm.

1913, July 5.—One small strobile, macerated, and a few fragments, longest 16 mm.

Transverse sections were made of the largest fragments. In details of structure of the genital cloaca, cirrus, cirrus-pouch, and vagina, which are satisfactorily shown in the sections, likewise in the musculature, there appears to be exact agreement with corresponding features in the shearwater material. The walls of the excretory vessels are thick, as in the species from the shearwater, and contain conspicuous longitudinal fibers. The latter do not appear in sections of shearwater material. The difference in this respect may be due to the somewhat macerated condition of the material from the night heron.

An average of ten cirrus-pouches gives the dimensions: 0.045 by 0.055 mm.; the smallest 0.041 by 0.054, and the largest 0.054 by 0.054.

The maximum number of muscle fibers appears to be about 20 in the inner bundles and 7 in the outer. The uterus is lobed. The proglottides sectioned were about 0.08 mm. in length and 1.26 mm. in breadth.

1913, August 5.—Fragments of strobile, longest 40 mm., no scolex.

## TETRABOTHRIUS MACROCEPHALUS (Rudolphi)

## Figures 23-31

*Scolex*.—There is a great variety of size and form; bothria oval-elliptical; anterior appendage prominent in larger scoleces, less prominent in smaller scoleces.

*Strobile*.—The larger strobiles are robust, thickish, neck sub-cylindrical; proglottides begin a short distance back of scolex, at first very short, increasing in length very slowly, much crowded, very much broader than long; ripe proglottides may become half as long as broad. Younger strobiles somewhat cylindrical, proglottides at first crowded, much broader than long, becoming nearly as long as broad. In all cases the margins of the strobiles are more or less serrate. In some of the longer strobiles the adult and ripe proglottides are somewhat campanulate. These are less robust than the majority of the longer strobiles, the proglottides are less crowded and of greater relative length. The scoleces in these two forms agree in details of structure. The muscular genital cloaca is situated near the margin at about the middle of the length of the proglottis. The cirrus opens on a small papilla, at the base of which is the opening of the vagina. The cirrus-pouch is at the median border of the genital cloaca. The cirrus is short and smooth; the rather voluminous vas deferens lies on the dorsal side of the medullary space, in some cases extending from the cirrus-pouch nearly to the median line; in one case it was observed to surround the dorsal excretory vessel. The exact number of testes is difficult to determine. They are rather numerous, as many as 20 appearing in the same transverse section, and representing from 35 to 40 or more in the proglottis. In a whole mount the number of testes, in a proglottis measuring 0.28 mm. in length and 0.56 in breadth, was estimated to be about 40. The diameter of the cirrus-pouch is about 0.075 mm. The vagina lies on the ventral side of the cirrus-pouch, is at first slender and more or less sinuous. It passes mediad near the ventral excretory vessel, enlarges, and continues mediad on the ventral side of the vas deferans to the border of the small, lobed vitelline gland, where it turns abruptly ventrad. The vitelline gland lies at the median line towards the anterior end of the proglottis, in front of the lobed ovary. The uterus, in ripening proglottides, is much lobed, the lobes tending to become obscure, or to disappear entirely in the older proglottides, which are filled with ova. Diameter of ova about 0.045 mm. The ventral excretory vessels are much larger than the dorsal, oval in section, the dorso-ventral diameter the greater, and, in a few series of sections, relatively large transverse vessels were shown at the posterior ends of the proglottides connecting the ventral vessels. In the scolex the vessels are abundantly distributed in the axial region, and at the lateral margins between

the two bothria, which, lying back to back, constitute a lateral pair. These lateral vessels form close spirals near the base of the scolex, where they are joined by the axial vessels to continue in the strobile as the dorsal and ventral lateral vessels.

There are two layers of longitudinal muscles, arranged in bundles, the outer layer consisting of many small bundles each containing few fibers, the inner layer consisting of fewer and larger bundles. In proglottides in which the uterus was rudimentary the outer bundles contained a maximum of about 30 fibers, the outer bundles about 7. In proglottides in which the uterus was well advanced, the inner bundles contained a maximum of about 20 fibers, the outer about 5. At the base of the scolex there is but a single layer of longitudinal muscles, which is separated from the cuticle by a granular layer containing many radial fibers. Near the scolex the layer of circular fibers, which encloses the medullary space, is conspicuous. It becomes less so in older portions of the strobile. Longitudinal sections give no indication of the formation of free proglottides. A tendency to separate from the strobile was observed only in the case of the slender variety.

#### RECORD OF COLLECTIONS

##### *Gavia immer*:

(U.S.N.M., Helm. Coll. 7863.)

1906, January 8.—Two loons examined; 12 tape worms in one, 30 in the other.

1911, July 1.—Fourteen large, with adult, loose proglottides, length 125 mm.; 6 small, also with loosening proglottides, length 10; 1, length 30.

1911, July 22.—Twenty-one large and small, with fragments; maximum length 100 mm., in alcohol.

1911, July 24.—One hundred and forty-seven scoleces and 77 strobiles and fragments without scoleces. There were two varieties, one relatively thick, much longer and larger than the other, which is slender and filiform. One of the larger measured 125 mm. when straightened in a dish and fixed in corrosive acetic. One of the smaller, slender strobiles measured 30, and another 45 mm. in length. There were intermediate forms, so that it would appear that these seemingly different forms simply represent different ages of strobiles of the same species. There is not a corresponding difference in the size of the scoleces.

1911, September 1.—About 20.

1913, January 1.—Twenty-three with scoleces; the largest strobile noted was 100 mm. in length, and 2.5 in greatest breadth, in formalin; scoleces large, length 1.12, breadth 0.84; ova with six-hooked embryos.

1913, February 13.—Sixteen with scoleces, all about the same size, length 68 mm., maximum breadth 2; ripe proglottides on practically all.

1913, February 15.—Thirty-one with scoleces, largest, length 80 mm., maximum breadth 2, smallest, length 30 mm., but with ripe proglottides.

1913, April 28.—Five with scoleces, longest 58 mm.

1913, December 31.—Fifty-six, largest, length 140 mm., maximum breadth 4; a small strobile, length 11, breadth 0.7.

1914, February 21.—Mass of strobiles, not disentangled and counted, but doubtless as many as noted on the label, 120. Two removed measured 178 and 200 mm. respectively; all appeared to be large, maximum breadth 4 mm.

1914, December 12.—Ten with scoleces, and a few fragments, longest 84 mm.

1914, December 26.—Seven strobiles, no scoleces; length 100 mm.

1915, July 7.—Thirty-one with scoleces.

1915, August 11.—Very numerous.

1917, January 26.—Seven with scoleces, and many fragments; longest about 55 mm.; 4 small, with apparently nearly mature proglottides.

1917, February 6.—Two with scoleces, and fragments aggregating a length of 1,200 mm.; 1 small strobile with scolex.

*Colymbus auritus*:

1904, March 3.—Two with scoleces, 12 and 54 mm. in length, respectively; maximum breadth 3.2.

1912, February 8.—Two strobiles with scoleces, 65 and 70 mm. in length, respectively, and fragments aggregating 315 mm.

1914, April 16.—Four scoleces; longest strobile 40 mm., maximum breadth 2.

1917, February 20.—Three strobiles with scoleces, and one fragment.

*Colymbus holboellii*, New host:

1905, December 11.—One and fragments.

1909, January 30.—A few fragments and one scolex.

**TETRABOTHRIUS SULCATUS, new species**

Figures 32-39

*Scolex*.—Squarish, with rather sharp and clear-cut outlines; the overhanging, shelf-like anterior appendage, characteristic of the genus, well developed on the margins, but less prominent in dorso-ventral aspects; length and breadth each about 0.35 mm.

*Strobile*.—The unsegmented portion has a tendency to narrow a short distance back of the scolex. The strobiles are slender and



filiform, the longest about 45 mm. The segments, as a rule, are much broader than long with a tendency to lengthen towards the middle of the strobile, where the length may become greater than the breadth. The segments are more or less wedge-shape, and are traversed by a deep and apparently permanent groove. The genital pores are situated a little in front of the margin. The cirrus appears to be a little longer than it is in the other species of this genus noted in this paper. The diameter of the cirrus-pouch, in transverse sections of the strobile 0.041, in frontal sections 0.065, in sagittal sections 0.051. The number of testes appears to be about 20. The vagina, opening into the genital cloaca near the cirrus, lies in a gentle curve on the ventral side of the cirrus-pouch and vas deferens. The vitelline gland is slightly, and the ovary strongly, lobed. The uterus in ripe proglottides fills the greater part of the medullary space; immature ova were seen which were oval-elliptical, and 0.04 mm. in the longer diameter.

The walls of the excretory vessels are thick, and there is a transverse vessel at the posterior end of the proglottides connecting the ventral vessels.

The bundles of the inner layer of longitudinal muscles are elliptical in section, and are made up of a maximum of about 25 fibers. The outer bundles contain from 3 to 5 fibers each.

A specimen mounted in balsam has the following dimensions: Length, 45 mm.; breadth of scolex, 0.34, length, 0.35; breadth of bothrium, 0.14, length, 0.33; breadth of neck, 0.21; distance to first distinct segment, 1.12; length of first segment, 0.03, breadth, 0.14; length of segment at middle of strobile 0.07, breadth 0.24; posterior segment, length 0.14, breadth 0.34. The greatest breadth was 0.56, length of segments at that point 0.08. The longest segment was 0.28, its breadth, anterior 0.14, posterior 0.28.

#### RECORD OF COLLECTION

##### *Fregata magnificens*:

1907, July 8.—A number of small cestodes were given me on this date by Dr. John W. Watson, which he had collected a few days before at Bird Key, Tortugas, Florida, from a man-of-war bird.

(U.S.N.M., Helm. Coll. 7864 (type).)

#### OPHRYOCOTYLE PROTEUS (Fries)

##### Figures 40-44

*Scolex*.—Short and broad; the so-called rostellum is a broad, terminal sucker with strong, muscular walls, and with a scalloped border which is armed with very numerous, minute spines. These

spines are nearly straight, with abruptly recurved tips, and with strong basal supports; length about 0.004 mm. They are very closely placed—about 20 counted in the space of 0.015 mm.—in a sinuous row following the scalloped border of the rostellum. The suckers are armed with sharp-pointed hooks, most strongly represented on the anterior border, but sparingly placed elsewhere on the sucker; length 0.008 mm. Diameter of scolex in balsam 0.28.

*Strobile*.—The segments begin very close to the scolex, at first much broader than long, with the posterior edge slightly projecting and rounded at the lateral margins. As the segments lengthen the posterior edges give to the lateral margins a serrate outline. Genital pores irregularly alternate, about the middle, or a little in front of the middle of the lateral margin; cirrus-pouch cylindrical, reaching nearly to the median line. The testes are at the posterior end of the proglottis behind the female genitalia. Their number was not satisfactorily made out, but there appear to be about nine. The vagina lies close behind the cirrus-pouch. It was traced to the median line where it was obscured by the ovary. The ovary is oval, transversely placed a little in front of the middle, and occupies about two-thirds of the breadth of the proglottis. Immediately behind it, at the median line, is the vitelline gland which appears in dorso-ventral view to be fusiform. In a proglottis 0.27 mm. in breadth the vitelline gland measured 0.054 by 0.018 mm. in the two principal diameters. Ripe proglottides are as long or longer than broad. The uterus occupies all the medullary space in the ripe proglottides. The ova are nearly circular in outline, with thin, membranous shells; diameter of onchosphere about 0.02 mm.

Dimensions of a strobile with ripe proglottides, in balsam: Length 10; breadth of scolex 0.25, length 0.21; diameter of sucker 0.08; breadth of rostellum 0.16; breadth of neck 0.12; length of segment 1 millimeter back of scolex 0.10, breadth 0.15; length of segment 5 millimeters back of scolex 0.32, breadth 0.32; length of segment near posterior end 0.58, breadth 0.35. Dimensions of small strobile: Length 3; breadth of scolex 0.29, length, 0.17; breadth of neck 0.11; length of segment 1 millimeter back of scolex 0.08, breadth 0.32; length of segment near posterior end 0.25, breadth 0.37.

#### RECORD OF COLLECTIONS

*Larus atricilla*, new host:

1914, September 29.—One scolex, and fragments of 2 strobiles; longest 40 mm., in formalin.

1915, May 18.—Twenty-eight short strobiles, from 2 to 4.5 mm. in length, with scoleces.

(U.S.N.M., Helm. Coll. 7865.)

*Larus argentatus*, new host:

1912, September 4.—Three small, longest about 9 mm., in formalin.

*DILEPIS UNILATERALIS* (Rudolphi)

— Figures 45-51

*Scolex*.—Short and broad; suckers orbicular, directed forward; rostellum short and stout, armed with two circles of hooks, 10 in each circle; length of hooks in anterior circle about 0.033 mm., in posterior circle, about 0.018; hooks with long basal and short ventral roots, blade moderately curved. It is difficult to determine the number and arrangement of the hooks on the retracted rostellum. One scolex was found among the mounted specimens with everted rostellum (fig. 46), from which the above details were obtained.

*Strobile*.—In most cases this is much narrower than the scolex for a short distance. It then increases in breadth, usually rather quickly, in some cases almost abruptly; nearly linear throughout; breadth of the posterior end of a proglottis greater than the anterior, imparting a more or less serrate outline to the lateral margins; genital pores unilateral, near the anterior end of the proglottis. In many cases the genital pore is at the summit of a papillary projection. The cirrus was seen exerted in only a few instances. It is relatively long and slender, and is armed with minute spines. The cirrus-pouch is elongate, subcylindrical, and reaches to about the median line, its inner end acting as a seminal vesicle. At its base near the median line, and at the anterior end of the proglottis, there is a voluminous vas deferens. The testes are about 10 in number, although 12 were counted in a few proglottides. They are situated behind and along the lateral margins of the ovary. In some adolescent proglottides two or three of the testes lay nearly in front of the ovary on the antiporal side. The vagina opens on the ventral side of the cirrus and lies a little posterior to the cirrus-pouch, turning dorsal in the vicinity of the vas deferens. It has thick, muscular walls, and is surrounded by a layer of what appear to be glandular cells. No seminal receptacle was seen. The ovary is relatively large, is composed of two lateral divisions, deeply lobed and united by a transverse portion at the median line. The vitelline gland is compact, and situated at the median line dorsal to the ovary. The uterus in ripe proglottides is profoundly lobed, and ultimately occupies the greater part of the interior of the proglottis. The cirrus and vagina pass between the excretory vessels of the poral side. A unique condition was noted in the character of the excretory vessels. On the poral side the ventral vessel is the larger, while on the antiporal side the dorsal vessel is the larger. This character was noted in different

series of transverse sections. There are two layers of longitudinal muscles, the outer with the more numerous bundles. The inner circle, as seen in transverse sections, is not quite continuous, one or two bundles being lacking in the vicinity of the excretory vessels.

In a strobile 8 mm. in length rudiments of genitalia could be seen 0.05 mm. back of the scolex; the full complement of testes was attained at a distance of a little less than 2 mm. from the scolex; the adult ovary was noted at about 3 mm. from the scolex; and at about the middle of the strobile, that is about 4 mm. from the scolex, the uterus appeared. At first the uterus consisted of an axial mass of ova, whose contours could not be made out in the whole mounts. From the axial mass lateral diverticula appeared in succeeding proglottides, the uterus soon becoming profoundly lobed. In the last two millimeters of the strobile, comprising about 12 proglottides, the uterus was lobed as shown in figure 49.

The ova were rather too closely packed in the uterus of the whole mounts to admit of satisfactory measurement. They appear to have two membranous shells, the diameter of the outer being from 0.024 to 0.03 mm. The following note was made on living material collected July 9, 1913: Shells of ova thin and at first collapsed; when placed in fresh water the outer shell became turgid; diameter of outer shell 0.066 mm., of inner shell 0.033, of onchosphere, containing a six-hooked embryo, 0.019.

Most of the strobiles in my collection are small, about 8 mm. in length, although a few are longer (see below) and are in close agreement with Clerc's description of the species.<sup>1</sup>

Measurements of strobiles mounted in balsam are as follows:

	Mm.	Mm.	Mm.
Length.....	8. 00	15. 00	23. 00
Diameter of scolex.....	. 12	. 14	. 14
Length of scolex.....	. 06	. 08	. 07
Diameter of suckers.....	. 05	. 05	. 06
Diameter of rostellum.....		. 05	
Length of rostellum.....		. 024	
Length of larger hooks.....		. 033	
Length of smaller hooks.....		. 018	
Length of posterior segments.....	. 21	. 30	. 35
Breadth of posterior segments.....	. 42	. 46	. 46

#### RECORD OF COLLECTIONS

From *Butorides virescens*:

1906, June 20.—Eighteen.

1912, August 14.—Nine from one of two herons, maximum length about 12 mm.

(U.S.N.M., Helm Coll. 7866.)

<sup>1</sup> Centralbl. Bakter, Parasit., vol. 32, pp. 714-715, figs. 3 and 4.

- 1913, July 9.—Five, no scoleces, maximum length about 12 mm.  
1913, August 14.—A few fragments of strobiles, no scoleces.  
1914, July 28.—Numerous, length of largest less than 10 mm.  
1916, July 20.—Numerous, 100 or more, from three herons, most of them about 5 mm. in length scoleces present in a few.

**CHOANOTAENIA PARINA (Dujardin)**

Figures 52-53

Three scoleces, and fragments of strobiles aggregating about 200 mm. in length, agree with descriptions of this species. Since there appear to be four strobiles represented in the lot, an average length of 50 mm. is indicated, which is the length recorded by Clerc for this species. The maximum breadth is about 0.8, which is in agreement with Clerc's record. A scolex with rostellum retracted measures 0.24 in breadth; another with rostellum exerted, and somewhat distorted, measures 0.16 in breadth; the diameter of a sucker is about 0.10. There are 20 hooks in a single circle, about 0.015 in length. There is a distinct unsegmented, or neck, portion of the strobile. The proglottides, at first broader than long, lengthen gradually and ultimately are longer than broad. There is, however, considerable variety in the shape of the proglottides, and the different contraction shapes impart much variety in the apparent disposition of the genitalia. The genital pores are irregularly alternate, and open near the anterior third of the margin of the proglottis. The general plan of the genitalia is shown in figure 53. The ventral excretory vessels are conspicuous in most of the proglottides except those which are filled with ova. A typical ovum measured 0.045 by 0.033; diameter of onchosphere 0.03; length of onchosphere hooks 0.018.

From *Passer domesticus*, August 30, 1923.  
(U.S.N.M., Helm. Coll. 7867.)

**CHOANOTAENIA RANSOMI, new species**

Figures 54-68

The taenioids referred to this species were collected from several species of gulls, on many widely separated dates, mainly by Vinal N. Edwards, and all from the Woods Hole region; also a few taenioids from the loon appear to belong here.

They present a great variety of contraction shapes, but there do not appear to be differences sufficient to justify their assignment to different species.

*Scolex*.—There is little difference in the size and shape of the scoleces; in general it is broader than long. Thus, an average of

eight scoleces from *Larus atricilla*, mounted in balsam, gave a length of 0.22 mm. and a breadth of 0.32. The average diameters of the suckers on these scoleces were, length 0.15, breadth 0.14. As a rule the suckers are nearly circular, the length often approximating that of the scolex, especially when the rostellum is retracted, and the breadth approximately one-half the breadth of the scolex. The rostellum is slender, cylindrical, and slightly enlarged at the apex, which is surmounted by a crown of about 20 hooks. These appear to be arranged in a single circle, but in specimens with the hooks in favorable position for showing the arrangement they may be seen to be in two circles, placed very near together, and with the hooks all practically of the same size. The hooks have long dorsal and short ventral roots and slender, slightly curved blades. Most of the hooks in my mounted material are characterized by having a central air space throughout the greater part of the length. The length of the hook is about 0.038 mm. The sheath of the rostellum is muscular, more or less fusiform, and, when the rostellum is retracted, reaches a little way back of the posterior edge of the suckers. Measurements and further details are given in descriptions of material from the several hosts.

*Strobile*.—The maximum length of formalin specimens is about 140 mm., and the maximum breadth about 2 mm.; a maximum length of 75, and breadth of 1.5 or less, is more usual.

The following description of the strobile is based on material from *L. atricilla*, and is in practical agreement with notes made on material from other gulls. Further details will be found in the records made of material from the several hosts. There is a short neck, which is usually a little narrower than the scolex; measurements of the eight strobiles in which the average breadth of the scolex was 0.32 gave the average breadth of the neck 0.29, distance from scolex to first distinct segments 0.56, length of first segments 0.014, breadth 0.23. In most cases near the scolex the segments are much broader than long. They then usually lengthen rather rapidly so that at a point 2 mm., or less, from the scolex they are as long as, or longer than broad. The proportions of the proglottides may vary considerably in different parts of the strobile. Thus, in a mounted specimen measuring 75 mm. in length, about 1 mm. from the scolex the length of the proglottides was about 0.028, the breadth 0.30; 2 mm. from the scolex, length 0.11, breadth 0.22; 5 mm. from the scolex, length 0.21, breadth, 0.13 at posterior end, 0.11 at anterior end of proglottis; at 30 mm. from the scolex, length 0.52, breadth, anterior 0.18, posterior 0.32; 40 mm. from scolex, length 0.45, breadth 0.50, 50 mm. from scolex, length 0.63, breadth 0.63 (variable, as for examples, the proglottis in front of this, length 0.67, breadth 0.56;

the proglottis following, length 0.62 on one margin, 0.35 on the other, breadth 0.74); posterior proglottis, length 0.63, breadth 0.80. In a lot of small strobiles, 5 to 7 mm. in length, one had the following dimensions: Length 7; 1 mm. back of scolex, length of proglottis 0.05, breadth 0.28; 2 mm. back of scolex, length 0.10, breadth 0.28; 5 mm. back of scolex, length 0.11, breadth 0.52; 1 mm. from posterior end, length 0.13, breadth 0.57; posterior proglottis, length 0.24, breadth 0.32. The genital apertures are irregularly alternate near the anterior end of the margin of the proglottis. The walls of the genital cloaca are thick and muscular; cirrus-pouch slender, cylindrical; cirrus not clearly shown in my preparations. What appear to be loops of the vas deferens occupy the inner two-thirds of the length of the cirrus-pouch. There is a voluminous vas deferens, its folds lying on the dorsal side of the cirrus-pouch, and between its inner end and the median line. There is no seminal vesicle. The testes lie posterior to the female genitalia. Their exact number was not determined. About 12 was the greatest number observed in transverse sections of about 0.015 mm. thickness. The number is probably about 20. The vagina opens into the genital cloaca posterior to the cirrus. It follows a sinuous course to the median line where it terminates in a subglobular seminal receptacle about on a level with the genital pore. The vitelline gland is bluntly lobed, situated at the median line a little posterior and ventral to the seminal vesicle. In a transverse section, 0.56 by 0.50 mm. in the two principal diameters, the vitelline gland measures 0.098 by 0.056. The ovary is profoundly lobed, its divisions being in general pyriform. It lies in front of the vitelline gland, and is nearly symmetrical with respect to the median line; its breadth approximately two-thirds the breadth of a mature proglottis. The uterus is at first sacculate. In ripe proglottides the entire medullary space is filled with ova. The ventral excretory vessels are much larger than the dorsal, and are connected by a transverse vessel at the posterior end of the proglottides. The cirrus-pouch and vagina pass between the poral pair of excretory vessels. There are two layers of strong longitudinal muscles, but circular muscles were not seen in any of the sections.

Following are notes on material referred to this species from other species of gulls:

From the herring gull (*Larus argentatus*):

The average breadth of 12 scoleces mounted in balsam, is 0.42, minimum 0.35, maximum 0.52; average diameter of sucker 0.18, minimum 0.17, maximum 0.22; length of hooks 0.036; number of hooks about 20. An everted rostellum measured 0.21 mm. in length, same as the length of the scolex, diameter at base 0.06, behind hooks 0.04,

at apex, including hooks, 0.09. In lateral view the scolex may appear decidedly broader than the neck, and bluntly sagittate. In dorso-ventral view the anterior end is bluntly rounded and the posterior end merges into the strobile, which is smooth for a short distance, often as broad as the scolex, in some cases a little broader, in others a little narrower, but almost invariably narrowing as proglottides make their appearance. Segments appear in specimens mounted in balsam about 0.28 mm. back of the scolex. As the proglottides develop they tend to produce serrate margins on the strobile. Usually they soon become squarish, then longer than broad, and more or less campanulate, again shortening until they are broader than long, and ultimately they may again become as long as broad. The cirrus-pouch, as it appeared in a series of transverse sections was slightly pyriform, measuring 0.08 mm. in length, and 0.04 in diameter in a section 0.38 by 0.28. In these sections the vagina was seen to be flexed in one or two sinuous folds. The cirrus-pouch and vagina lie between the dorsal and ventral excretory vessels, and dorsal to the lateral nerve. Diameters of section of ventral excretory vessel 0.024 by 0.033, of dorsal vessel 0.009 by 0.012. Diameter of ovum, outer shell 0.072 by 0.065, inner 0.043 by 0.036, onchosphere 0.032 by 0.02, length of embryonic hooks 0.015.

From the black-backed gull (*Larus marinus*):

The scoleces of the two specimens from this host agree in all essential characters with those from *L. atricilla*. The lateral margins of one of the strobiles are serrate, the usual condition, those of the other are somewhat crenulate. The latter strobile is stouter than the other, and the proglottides were not mature. A similar difference was noted in strobiles from the herring gull. A diagram of the female genitalia, as interpreted from a series of transverse sections, is shown in figure 63. Dimensions of the larger strobile in balsam: Length 40 mm.; diameter of scolex 0.33, of sucker 0.16; length of hooks 0.03; breadth of neck 0.35; distance to first segment approximately 0.28, length approximately 0.01, breadth 0.32; length of last proglottis 0.32; breadth 0.45. Length of smaller strobile 30; diameter of scolex 0.32, of sucker 0.15; breadth of neck 0.28; length of hooks 0.03; length of last proglottis 0.17, breadth 0.90.

From the Bonaparte gull (*Larus philadelphia*):

The average diameter of five scoleces, in balsam, is 0.35 mm., of suckers, 0.18; number of hooks about 20, length 0.038. As in the strobiles from the other gulls, there is much diversity of shape. In some the proglottides are closely crowded at first and much broader than long throughout. In others the proglottides begin to lengthen near the scolex, and have a tendency to become more or less campanulate. There are intermediate forms, both of larger



and smaller strobiles. In most cases the lateral margins are rather sharply serrate. In ripe proglottides the uterus occupies practically the entire interior.

From ring-billed gull (*Larus delawarensis*):

One strobile, scolex, and anterior end missing, agrees in all essentials with those from other gulls.

Among the strobiles from *Larus philadelphia* referred to this species are two, scoleces missing, which may belong to a different species. They are characterized by having the ripe proglottides longer than broad, and attached by a slender anterior pedicel, thus giving a moniliform aspect to the chain (fig. 68). The genital pores, which are irregularly alternate, instead of being near the anterior end of the strobile, are farther back, although still in front of the middle of the margin. The genitalia are but imperfectly shown. The vas deferens could be traced from a point near the median line to the cirrus-pouch. It lies in more or less tangled coils, of which the more median are the larger, tapering to a slender thread at the cirrus-pouch. The cirrus-pouch is oval-elliptical, thin walled, and contains a few loops of the vas deferens. The relative position of the ovary, vitelline gland, and testes, so far as could be made out, agrees with that of the other strobiles. Dimensions of larger strobile, in balsam: Length 25 mm.; breadth at anterior end 0.25; distance to first distinct segment about 0.42; length of first segment, approximately 0.02, breadth 0.31; ripe segments 20 mm. from anterior end, length 1, breadth 0.7; last segment, length 1.12, breadth 0.66.

#### RECORD OF COLLECTIONS

All from Woods Hole region; collections in all months, except July and August, made by Vinal N. Edwards.

#### *Larus argentatus*:

- 1903, November 16.—Two strobiles and six fragments.
- 1903, November 21.—Two with scoleces.
- 1904, December 3.—One, length, in formalin, 24.5.
- 1906, February 6.—One, scolex missing.
- 1906, February 12.—A few fragments, no scoleces.
- 1907, February 28.—Few, number not recorded; no scolex.
- 1912, February 19.—One.
- 1912, November 13.—Fragments, longest 34 mm., no scolex.
- 1913, January 8.—Many fragments, 14 scoleces.
- 1913, April 28.—Few fragments, 2 scoleces.
- 1913, November 17.—One, length 70 mm.
- 1913, December 31.—One strobile with scolex, length 130 mm.

- 1914, April 29.—Large number, 61 with scoleces; maximum length 34 mm., all immature.
- 1914, December 23.—Fragments representing about six strobiles, no scoleces.
- 1914, December 26.—Eleven strobiles, longest 135 mm., greatest breadth 1 mm., no scoleces.
- 1914, December 30.—Four fragments, no scoleces.
- 1915, September 1.—Three strobiles, and fragments, longest 90 mm., maximum breadth 1.12; one scolex; diameter of ovum 0.063, of onchosphere 0.039; length of embryonic hooks 0.014.
- 1915, October 5.—Twenty-six, longest with scolex 50 mm.
- 1915, November 1.—One, length 7 mm.
- 1916, March 9.—Three, lengths 7, 12, and 50 mm.
- 1916, December 19.—Three, short, rather plump, longest 15 mm.
- 1919, January 27.—Five, 10 to 72 mm. in length; no scoleces.

*Larus atricilla:*

- 1908, August 27.—Four with scoleces; ripe proglottides containing ova with six-hooked embryos.
- 1911, July 21.—Fragments representing four strobiles, longest about 100 mm.; one scolex.
- U.S.N.M., Helm. Coll. 7869 (paratypes).
- 1913, April 23.—Five with scoleces, many fragments, longest about 50 mm.; breadth 1 mm.
- 1913, April 29.—One, scolex missing.
- 1913, July 3.—One, scolex missing.
- 1913, August 5.—Nine with, and four without scoleces; all short and somewhat clavate; maximum length 9 mm.
- 1914, July 30.—Four with scoleces and several fragments, maximum length 75 mm.

(U.S.N.M., Helm. Coll. 7868.) (Type.)

- 1915, August 13.—Two fragments 7 and 40 mm. in length; maximum breadth 2; no scolex.
- 1916, October 7.—Many fragments, longest 20 mm., maximum breadth 1; no scolex.
- 1916, October 28.—One, length 48 mm.; maximum breadth 0.6.

*Larus delawarensis:*

- 1914, January 24.—One, length 48 mm.; scolex missing.

*Larus marinus:*

- 1904, January 19.—About seven strobiles, not all with scoleces; maximum length 60 mm.

*Larus philadelphia:*

- 1906, November 16.—Two gulls examined, 15 worms found in older, none in younger.
- 1906, November 25.—One hundred and seventy strobiles from two gulls.

1912, November 15.—Seven gulls examined; 35 strobiles, and fragments from two birds; longest strobile noted 72 mm.

1912, November 20.—Four gulls examined; seven strobiles, two with scoleces, from one bird.

1912, December 21.—Eight gulls examined; four strobiles with scoleces, and a few fragments.

1913, April 3.—Eight gulls examined; nine strobiles with scoleces, and eight fragments from two birds; maximum length about 62 mm.

*Gavia immer*:

1915, August 11.—Few.

This species from the loon appears to be identical with that from the gulls, and is therefore recorded under *C. ransomi*. The diameter of scoleces in balsam is from 0.35 to 41 mm.; diameter of sucker about 0.18; length of hooks about 0.032. The arrangement of the hooks of the rostellum, as in those from gulls, is difficult to interpret. In most views there appears to be a single circle of hooks, but in favorable position they are seen to be as shown in figure 59; that is, in two very closely placed circles. The hooks are all of practically the same length.

CHOANOTAENIA, species

Figures 69, 70

A scolex found on a slide along with several strobiles of *Hymenolepis ductilis* from *Larus argentatus* differs from other species in the collection. The size and shape of the hooks suggest *C. porosa*, although the number appears to be 12, instead of 14, the number given for that species.

(U.S.N.M., Helm. Coll. 7870.)

The scolex is broader than long, and the suckers have strong, muscular borders. The rostellum is retracted but is clearly shown. It is slender with thickish, muscular walls, and appears, as it lies in its sheath, as a rigid, pestle-shaped structure, with a bulbous enlargement at the anterior end, whose diameter is about equal to the length of the hooks. From this anterior hook-bearing end it tapers to a bluntly rounded posterior end. This slender, tapering portion, beginning at the level of the anterior borders of the suckers, extends for a distance equal to half of its length back of the posterior borders of the suckers. Breadth of scolex 0.40 mm.; diameter of sucker 0.18; length of hooks 0.105; length of rostellum 0.42; distance to first segments 0.28; length of first segments 0.01; breadth 0.28. The neck is of about the same breadth as the scolex. About 0.25 mm. behind the scolex the strobile narrows, and the last segments, which are 0.84 mm. back of the scolex, have a length of 0.07 and a breadth of 0.25.

## HYMENOLEPIS ANCEPS, new species

Figures 71-78

*Scolex*.—Bluntly rounded or pyramidal, suckers directed forward; rostellum not seen exerted, but evidently short; hooks in a single circle, about 18, length about 0.012 mm., strongly recurved, dorsal root short, ventral root about as long as the recurved blade.

*Strobile*.—Segments begin a short distance back of the scolex, at first much crowded, breadth many times the length, increasing in length and breadth gradually, but remaining much broader than long. There are two types of strobiles. In one the anterior segments are exceedingly short, with rounded margins, imparting a finely crenulated margin to the strobile, breadth much greater than the length; for example, breadth 0.28 mm., length 0.014 (fig. 74). In the other type the segments soon become well defined with the breadth of the posterior end greater than the anterior, giving a sharply serrate lateral margin to the strobile; for example, breadth 0.21 mm., length 0.028 (fig. 73); maximum breadth about 3 mm. Genital pores unilateral, about middle of margin, or a little in front of middle; cirrus short, unarmed; cirrus-pouch long oval-elliptical, with rather thin wall. In an adult, unripe proglottis 0.24 mm. in length and 1.92 in breadth the cirrus-pouch measured 0.28 in length and 0.056 in diameter. The inner two-thirds, or more, of the cirrus-pouch functions as a seminal vesicle. The folds of the vas deferens at the base of the cirrus-pouch are voluminous but were not seen to expand into an inner seminal vesicle. Testes three, lobed, two of them close together on the antiporal side of the median line, one on the poral side (fig. 75). The vagina opens on the ventral side of the cirrus; at first a slender tube lying on the ventral side of the cirrus-pouch, it expands into a large seminal receptacle which persists after the uterus has developed (fig. 76). The ovary is small, lobed, situated on the median line. The vitelline gland is compact, three-lobed. when fully developed, on the median line dorsal to the ovary. The uterus is irregularly lobed and extends from margin to margin in the ripe proglottides (fig. 76). The dorsal and ventral vessels of each pair of lateral excretory vessels lie near together, the ventral being much larger than the dorsal, and the cirrus and vagina pass dorsad of the poral pair. The longitudinal muscles are strongly developed, and lie in two circles, an outer continuous and an inner discontinuous layer (fig. 77).

The following measurements were made of specimens mounted in balsam: Breadth of scolex from 0.13 to 0.16 mm.; diameter of suckers 0.075; length of hooks about 0.012. No complete strobile was mounted. In one measuring 54 mm. the length of the posterior proglottis was 0.24, the breadth 1.92.

## RECORD OF COLLECTIONS

(U.S.N.M., Helm. Coll. 7871.) (Type.)

From *Mergus serrator*:

1913, April 1.—One, scolex missing, length 75 mm., maximum breadth 2.5.

1913, April 15.—Fragments of strobiles, aggregating 165 mm., longest 75, maximum breadth 3.75.

1914, February 24.—About 30, half of them with scoleces. In one strobile, measuring 130 mm. in length, the maximum breadth was 2.25, and the diameter of the scolex was 0.21; in another, measuring 295 mm. in length, the maximum breadth was 3, and the diameter of the scolex 0.22.

1914, February 28.—Twelve with scoleces, and an equal number of fragments; longest 153 mm., maximum breadth 4 mm.

HYMENOLEPIS ARDEAE (Fuhrmann)

Figures 79-88

*Scolex*.—Short, broad, rounded in front; suckers circular, directed forward; rostellum with single circle of 10 hooks, long dorsal and short ventral roots, length about 0.033 mm. Diameter of scolex, in balsam, 0.35 mm., of sucker 0.08 to 0.09 mm.

*Strobile*.—Segments begin a short distance back of the scolex, much broader than long throughout, flaring at basal border forming a bluntly serrate outline on the lateral margins; genital pores unilateral, near anterior end of the proglottis; length 125 mm., breadth 3 mm. or more.

*Male genitalia*.—Cirrus short, cylindrical, bluntly tapering at apex, thickly beset with short, slender spines; length of cirrus about 0.090, diameter 0.045, length of spines 0.007 mm. The cirrus-pouch in unripe proglottides is subcylindrical, its inner end functioning as a seminal vesicle, length 0.28, diameter 0.07 mm.; in ripe proglottides only the outer portion, into which the cirrus can be retracted, remains, length 0.25, diameter 0.12 mm. A short vas deferens leads to an inner, oval-elliptical seminal vesicle. The testes are three in number, comparatively small, and lie side by side at the same level, a little to the poral side of the median line. The inner seminal vesicle is contiguous with the lateral margin of the lateral testis.

*Female genitalia*.—The vagina opens on the ventral side of the cirrus. It is a thin-walled, slender tube, except near the external opening, where the walls are somewhat thickened. Its course is parallel to the cirrus-pouch, near the ventral side of which it lies, on the dorsal side of the excretory vessels. On the dorsal side of the ovary and near the shell gland it ends in a small oval-elliptical semi-

nal receptacle. The ovary is small, lobed, and is symmetrically placed with respect to the median line, on the ventral side of the proglottis. The vitelline gland is small, situated at the median line, dorsal to the posterior border of the ovary, and ventral to the shell gland.

The uterus in ripe proglottides occupies practically all of the medullary space inside the layer of longitudinal muscles. In one series of transverse sections the ova were aggregated in the lateral regions (fig. 83).

The longitudinal muscles are represented by two layers, an outer of smaller, and an inner of larger bundles. These were not studied in detail, but in one section the larger bundles were found to contain from 20 to 40 fibers, and the smaller from 10 to 20. In transverse sections these bundles of fibers are usually oblong-elliptical in outline with the longer diameter radial.

The marginal excretory vessels lie close together, the ventral being much larger than the dorsal. The poral pair lie on the ventral side of the cirrus and vagina. In figure 83 it is seen that the ventral excretory vessel persists in the ripe proglottis, lying in the lumen of the uterus. Diameter of ova about 0.027 by 0.021 mm.

#### RECORD OF COLLECTIONS

*From Butorides virescens:*

(U.S.N.M., Helm. Coll. 7872.)

1887, July 29.—One, length 102 mm., breadth 2.2.

1913, July 9.—Two, each about 100 mm., maximum breadth 5 mm.

1913, July 12.—One, length 125; three fragments.

1916, July 20.—One, length 85 mm., in intestine of one of three herons.

#### HYMENOLEPIS CORONULA (Dujardin)

Figures 89-93

*Scolex*.—Short, bluntly rounded in front, with suckers directed forward (in scoleces with rostellum retracted); rostellum short; hooks about 20, in a single circle, strongly recurved, length about 0.01 mm. Diameter of scolex 0.15, of suckers 0.07, of circle of hooks 0.03.

*Strobile*.—Neck at first usually as broad, or broader than the scolex, narrowing slightly a short distance behind the scolex; first segments about 0.5 mm. from the scolex. The proglottides are very short and crowded even in the longer strobiles. The last proglottis in the smaller mounted strobiles is narrower and longer than the

preceding proglottides. The strobiles are throughout their length thick and robust. The genital pores are unilateral, the cirrus, so far as could be made out, is rather short and smooth; the inner two-thirds, or more, of the cirrus-pouch is cylindrical and acts as a seminal vesicle. It is connected by a slender vas deferens with an elongated and capacious inner seminal vesicle. The testes are three in number, relatively large and lie near together in the median region. In sections of younger portions of the strobile the two anti-poral testes touch each other, and the poral testis lies very close to its anti-poral neighbor. Sections made farther back, where the female genitalia are developing, show a greater space between the poral and the nearer anti-poral testis, but the testes remain comparatively close together. The ovary is relatively small and lobed; the vitelline gland still smaller, compact, and situated on the ventral side of the ovary. The vagina is seen in transverse sections to lie along the ventral side of the cirrus-pouch. For a short distance it is thick-walled then it becomes thin-walled and slender for a distance approximately equal to the length of the cirrus-pouch, when it expands into an elongated, more or less sinuous seminal receptacle. The cirrus-pouch and vagina pass dorsally to the excretory vessels. The excretory vessels lie close together, the ventral much larger than the dorsal, and both are thrown into close spirals. The uterus, as seen in transverse sections, appears to be tubular, and probably lobed. Portions of it appear in the mid dorsal region extending lateral to the excretory vessels nearly to the lateral limits of the medullary area, and in the medullary area on the anti-poral side of the ovary. The uterus in these sections does not contain ova, but is filled with germ cells intermixed with yolk granules. There are two layers of longitudinal muscle fascicles. The outer layer is continuous, the inner interrupted, and represented by about 8 dorsal and 8 ventral fascicles in the median region, and by one or two fascicles, dorsal and ventral, in the vicinity of the excretory vessels. The strobiles are too thick for satisfactory study as whole mounts. In thick frontal sections of adult proglottides the small, lobed ovaries, and compact vitelline glands along the median line, the capacious seminal vesicles and seminal receptacles on the poral side of the median line, and the close spirals of the ventral excretory vessels are the most conspicuous objects. Both the seminal vesicles and seminal receptacles were filled with spermatozoa. The testes, while plainly seen, are not so conspicuous as the ovary and seminal vessels. Maximum length of strobile 128 mm.; maximum breadth 2 mm.

The above description was based on material from *Oidemia perspicillata*. Following are notes on strobiles, scoleces missing, from *Glaucionetta clangula americana*.

This material comprises a number of fragments of strobiles, representing two individual chains, 33 and 52 mm. in length, respectively. A characteristic of these strobiles is the variety of shapes which the proglottides have assumed in different regions. Thus, in one strobile, the anterior portion for about 9 mm. consists of proglottides which are at first distinct and somewhat wedge-shape, length 0.25 mm., breadth 0.35. These are followed by proglottides 0.28 in length and 0.42 in breadth. At the posterior end of this 9 mm. portion the length of the proglottides has decreased to 0.18 and the breadth increased to 0.63. At this point the character of the proglottides changes abruptly. For a distance of 3 mm. the proglottides are closely crowded, the length being about 0.06 and the breadth 1.12. Beyond this thickened portion the proglottides again become wedge-shape, length 0.35, breadth at anterior end of proglottis 0.56, at posterior end 0.75. This condition is maintained for about 8 mm. The remainder of the strobile is made up of proglottides which become broader and shorter. At about the fourth proglottis from the posterior end the length is 0.28, the breadth 1.54. Genitalia begin near the anterior end. The cirrus-pouch and testes show distinctly in the proglottides, which immediately precede the thickened portion. The latter is rather opaque, the testes and rudiments of the female genitalia are crowded into a laterally elongated mass which occupies the middle third of the breadth of the proglottis. In the first distinct segments behind the thickened portion the testes are much larger than they are where last seen in front of the thickened portion. While in the last segment in front of the thickened portion the diameter of a testis is barely 0.07 mm., the diameter of a testis in the first distinct segment back of the thickened portion is 0.15 mm. Moreover, the ovary and vitelline gland, which were not distinguishable in front of the thickened portion, are clearly shown in the proglottides which succeed the thickened portion. The ovary increases in size and becomes more lobed in succeeding proglottides. The posterior proglottides are again much crowded, and the anatomy is difficult to interpret. Essentially the same characters are shown in the other strobile. In maturing proglottides the ovary increases in size and in number of lobes, while the testes decrease in mass, and what seems to be a relatively spacious seminal vesicle appears posterior to the median end of the cirrus-pouch. The genital pores are unilateral. The cirrus-pouch is long-pyriform, largest at its inner end. In younger segments its inner end is near the anterior border not far from the median line. Thence it passes postero-laterad to the margin, where it opens at the genital cloaca, a little in front of the middle of the length of the segment. The testes are three in number and lie near together at the middle portion of the posterior end of the



segment. The length of the cirrus-pouch is about 0.35 mm. and its diameter, maximum, 0.07. The cirri were retracted. They appear to be smooth. The vas deferens is straight with rather rigid walls from a point a little mediad of the middle of the length of the cirrus-pouch to its lateral extremity, where it opens into the genital cloaca near the entrance of the vagina. The cirrus could not be made out, but it appears to be represented by a recess in the anterior wall of the genital cloaca (fig. 93) corresponding to Wolffhügel's figure.<sup>2</sup>

#### RECORD OF COLLECTIONS

*Oidemia perspicillata*, new host:

1913, May 8.—Six larger, length about 128 mm., breadth 2;  
6 smaller, length from 15 to 25 mm.

(U.S.N.M., Helm. Coll. 7873.)

*Glaucionetta clangula americana*, new host:

1914, December 28.—Two strobiles, 33 and 52 mm. in length, no scoleces.

#### HYMENOLEPIS DUCTILIS, new species

Figures 94–101

Certain small, slender taenioids from the herring gull, suggesting *H. microsoma* (Creplin), but differing from that species in the smaller size and the shape of the hooks, in the smaller and less lobed ovary, and the more slender cirrus-pouch, are here referred to a new species.

*Scolex*.—Somewhat pyramidal, breadth, in balsam, about 0.2 mm.; suckers oval-elliptical, a little longer than broad, for example, length 0.12, breadth 0.10, average diameter in balsam 0.11; rostellum much longer than scolex, slender with single crown of hooks, 10 in number, length about 0.039, rather slender, ventral root short, dorsal root long and slightly curved at the tip, blade much shorter than ventral root.

*Strobile*.—Small, slender; neck short, segments at first very short, increasing in length and breadth slowly, but throughout much broader than long. Thus, the posterior, ripe proglottides in a strobile mounted in balsam, measured 0.07 in length and 0.35 in breadth; lateral margins usually sharply serrate. The genital pores are unilateral, and situated toward the anterior end of the margin. The cirrus-pouch is cylindrical, or long-fusiform, usually more or less curved or spiral, in earlier portions of the strobile extending to the median line, or beyond it; in a proglottis measuring 0.33 mm. in breadth, the cirrus-pouch measured 0.17 in length and 0.024 in

<sup>2</sup> Kenntniss der Vogel helminthen, fig. 103.

diameter; the inner portion of the cirrus-pouch functions as a seminal vesicle. The cirri are slender, slightly tapering, and smooth; maximum length of exerted cirri about 0.11, diameter 0.006. Figure 99 is a camera lucida sketch of a specimen mounted in balsam, in which the lateral margin of the strobile is grooved. This may be a contraction feature, although the same peculiarity was noted in more than one strobile. There is an inner seminal vesicle, which is circular in outline as seen in ventral view. It lies on the ventral side of the cirrus-pouch (fig. 97). The three testes are close together near the median line, one poral, the others antiporal. They are relatively large, as compared with the length of a proglottis in the anterior proglottides, but become less conspicuous as the female genitalia develop. The vagina is postero-ventral to the cirrus-pouch. There is a relatively spacious seminal receptacle in front of the ovary at the median line. The ovary was not satisfactorily shown in the mounted material. So far as it could be made out it is small, but little lobed, its two main divisions not quite symmetrical. The vitelline gland, so far as could be determined, is small, compact, and lies behind the ovary. In the posterior proglottides of strobiles measuring 18 mm. in length the uterus occupies the greater part of the medullary space. It appears as a rather compact mass with evenly rounded outlines. The ova, so far as could be seen, in whole mounts, measured about 0.036 in diameter of outer, and 0.018 of inner shell. The ova seen in transverse sections are without shells, and measure 0.015 in diameter. In two strobiles the uterus, in the posterior proglottides, is more strongly developed on the aporal than it is on the poral side. This asymmetrical development caused the strobile at this place to become arcuate. Although the segments in one of these strobiles with aporal development of the uterus are shorter, and more crowded together, and the strobile is more delicate and fragile than the others, there does not seem to be warrant for regarding it as specifically different from the others.

Three strobiles, mounted in balsam, and each measuring about 18 mm. in length, have the following average dimensions: Breadth of scolex 0.24, diameter of sucker 0.12, length of posterior proglottis 0.08, breadth 0.50.

The only sections made were of ripe proglottides. They show the dorsal and ventral excretory vessel of each marginal pair to be close together and not differing greatly in size. The genital canals pass on the dorsal side of the excretory vessels. The longitudinal muscles are arranged in two layers, an outer consisting of many small bundles, and an inner consisting of eight larger bundles, somewhat symmetrically placed (fig. 101). The foregoing account is based on material from the herring gull (*Larus argentatus*).

From the black-backed gull (*Larus marinus*):

There is one slide in the collection. It contains 8 fragments of strobiles, three of them with soleces. They agree with the species from the herring gull in number, size and shape of hooks, in the dimensions and character of the scolex, and in the anatomy of the proglottides, so far as it is shown. Breadth of scolex 0.25 mm., diameter of sucker 0.14, length of hooks 0.036; length of maturest proglottides 0.07, breadth 0.50. Genital pores unilateral; cirrus-pouch cylindrical, more or less spirally curved, extending to, or beyond, the median line. All fragments small, and rather delicate.

#### RECORD OF COLLECTIONS

##### *Larus argentatus*

(U.S.N.M., Helm Coll. 7874 (type).)

1905, May 4.—Several anterior ends of strobiles, 1 scolex.

1912, February 16.—Ten slender strobiles.

1912, February 17.—Five soleces; small, slender strobiles.

1913, February 12.—One, length 13 mm., scolex missing.

1913, November 13.—Many fragments of strobiles, soleces missing.

1913, November 17.—One scolex.

1913, November 18.—Three soleces; several strobiles, soleces missing.

1914, January 20.—Two soleces, one with slender strobile.

1915, April 8.—One hundred strobiles, more or less, and a few soleces; small, fragile, much broken, longest about 16 mm.

1915, October 5.—Three soleces, diameter 0.22 mm.; length of strobile 15.

1916, February 17.—Two small fragments.

1916, April 18.—One hundred and forty-one soleces from young herring gull; maximum length of strobile about 25 mm.; many fragments of strobiles, a few of them consisting of mature segments very loosely attached to each other.

1917, January 8.—Four very small, immature, with soleces; maximum length 12 mm.

##### *Larus marinus*:

1914, April 28.—A few small strobiles, about 15 mm. in length.

#### HYMENOLEPIS FUSUS (Krabb)

Figures 102-104

*Scolex*.—Small, suckers nearly circular in outline, rostellum relatively stout, hooks strongly recurved, 10, about 0.02 mm. in length.

*Strobile*.—All the strobiles in the collection are immature. In all cases they are slender, the maximum breadth not exceeding 0.35 mm.,

and all having a tendency to become narrower toward the posterior end. In most cases the segments appear less than 1 mm. back of the scolex; in one strobile, which was about twice as long as the longest of the others, the neck was over 3 mm. in length. The first segments, at first much crowded, and little more than transverse rugae, remain much broader than long, until the posterior end, where, in most cases, they become, for a short distance, slightly narrower and somewhat lengthened. Thus, in the longest mounted specimen, measuring about 30 mm. in length, the breadth of segments 0.4 mm. from the posterior and is 0.33 and the length 0.05. The posterior segment is not perfect, but the penultimate segment measures 0.21 in breadth and 0.07 in length. The posterior segment in another strobile was 0.10 mm. in length and 0.15 in breadth; 05 mm. from the posterior end the segments were 0.02 in length and 0.28 in breadth (fig. 104). The cirrus and cirrus-pouch are rudimentary, but it can be seen that the reproductive pores are unilateral. Rudiments of a seminal vesicle appear in the posterior segments of some of the strobiles as a slightly sinuous mass which lies along the anterior border of the segment to a point about half way between the median line and the aporal margin. The three testes are small and placed near together in the postero-median part of the proglottides.

The agreement in number, size, and character of the hooks with *H. fusus* is close; the size of the strobile, however, is much less.

#### RECORD OF COLLECTION

*Larus argentatus*, new host:

(U.S.N.M., Helm. Coll. 7875.)

1912, July 22.—Fifteen with scoleces.

1913, January 6.—One strobile, scolex missing, very slender; length 26 mm.

1913, November 21.—Two; anterior end of strobiles exceedingly attenuate.

1914, January 20.—Two, very slender.

1914, September 8.—Few scoleces, several fragments, maximum length 100 mm., greatest breadth 1.5 mm.; anterior ends extremely attenuate.

1914, September 18.—One with scolex, length 55 mm., and fragments of about five strobiles.

1914, December 23.—One strobile with scolex from small gull.

1915, January 29.—Many fragments representing about eight strobiles, maximum length 34 mm., one scolex.

1915, April 5.—One scolex, and fragments of about three strobiles, maximum length 20 mm.

1917, January 17.—Two, slender, one with scolex, maximum length 25 mm.

1917, January 27.—Many fragments, no scoleces; maximum length 25 mm.

1918, January 8.—Many fragments, two strobiles, longest about 24 mm.

HYMENOLEPIS HAMULACANTHOS, new species

Figures 114–126

*Scolex*.—Somewhat pyramidal, when the rostellum is extruded; suckers relatively large; rostellum armed with a circle of 8 hooks, the basal ends of which are thin and claw-like; diameter of scolex, in balsam, 0.25, of sucker 0.13; length of hooks 0.108.

*Strobile*.—Anterior end slender; proglottides begin near the scolex, for the most part broader than long; at the anterior end, where the genitalia first appear, the length is 0.02, the breadth 0.14; near the posterior end, ripe proglottides, in a specimen mounted in balsam, are 0.56 long and 2.8 broad. At intervals there are regions where the breadth is only about three times the length. The proglottides, in the anterior fourth of a strobile measuring 112 mm. in length, are very short and crowded, the lateral margins of the strobile being crenulate. As the proglottides begin to lengthen their posterior diameter becomes greater than the anterior, and the lateral margins of the strobile are serrate. The genital pores are unilateral, near the anterior end of the proglottis, the cirrus and vagina opening near together in the genital cloaca. The cirrus is very long and slender, with a slight bulbous enlargement at the base which is spinose (fig. 121). The cirrus-pouch is elongate, somewhat clavate, and extends beyond the poral excretory vessels. Its inner half, or more, functions as a seminal vesicle; sagittal sections show that its walls are formed of longitudinal muscles. It communicates by a short vas deferens with an inner seminal vesicle which extends nearly to the median line, where it turns at nearly right angles and leads to near the posterior margin of the proglottis, where it receives vasa efferentia from the testes. There are three testes, one on the poral, two on the antiporal side. In maturing proglottides the testes are profoundly lobed (fig. 117). The vagina opens on the ventral side of the cirrus. For a short distance it has rather thick muscular walls, in a series of sagittal sections seen to be a sphincter muscle; it then narrows to a slender tube which lies on the ventral side of the cirrus-pouch for about half the length of the latter. It there expands into a capacious seminal receptacle, which sends a short, and rather broad duct to the vicinity of the shell-gland. The ovary is on the median line, and like the

testes, is in maturing proglottides profoundly lobed. The vitelline gland is a small, compact, bluntly-lobed gland lying on the median line dorsal to the posterior margin of the ovary, and ventral to the posterior margin of the shell-gland.

In whole mounts of strobiles with ripe proglottides the uterus is seen in earlier proglottides to be diffusely lobed. In regions of the strobile where the proglottides are closely crowded, and many times as broad as long, these lobes are more or less globular or pyriform (fig. 119). In longer proglottides, where the length may be as much as half the breadth, the lobes of the uterus are elongated and lie in a direction parallel to the axis of the proglottis (fig. 118). The ova, so far as they could be made out in whole mounts, are oval-elliptical; immature ova appeared to have a maximum diameter of 0.018. A mature ovum measured 0.039 by 0.015 in the two principal diameters. The outer layer of longitudinal muscles is represented by about 100 bundles containing but few, 3 to 5, fibers. The inner layer consists of 8 small bundles which are easily overlooked. No circular fibers were seen.

Dimensions of specimen mounted in balsam: Length 112 mm.; breadth of scolex 0.25, of sucker 0.136; length of hooks 0.108; breadth of neck 0.14; length of segments, 1 mm. from scolex, 0.02, breadth 0.15; length of posterior segments 0.51, breadth 2.38; maximum breadth 3.00, length 0.51.

#### RECORD OF COLLECTION

##### *Marila americana:*

1914, February 28.—Two strobiles and fragments. Dimensions of larger in formalin: Length 115 mm.; breadth of scolex 0.36, of neck 0.22; maximum diameter of strobile 3.25.

U. S. N. M., Helm. Coll. 7876.

#### HYMENOLEPIS MACRACANTHOS (Linstow)

##### Figure 105-113

*Scolex*.—Broader than long, suckers relatively large, with thick muscular walls; rostellum cylindrical, its sheath extending into the neck; hooks eight in number, 0.09 mm. in length; diameter of scolex in balsam 0.26 mm., of suckers 0.075. The hooks agree in detail with figures of *H. macracanthos*, but are smaller, being about 0.09 mm. in length, instead of exceeding 0.10 mm.

*Strobile*.—Segments begin rather abruptly close to the scolex, increase in length and breadth slowly, but remain much broader than long throughout. The male genitalia are fully developed while the female genitalia are still rudimentary; genital pores unilateral, at

about the middle of the margin of a proglottis; cirrus long and filiform, rigid, from a clubshaped thin-walled base (fig. 111). Diameter of basal portion, at its outer end, 0.024 mm., of filiform portion 0.002.; cirrus-pouch cylindrical, extending beyond the median line of the proglottis, its inner portion acting as an outer seminal vesicle; an inner seminal vesicle lies along the dorsal side of the cirrus-pouch; testes three, one on the poral side of the median line, two on the antiporal side, oval, about 0.048 by 0.060 mm. in diameter. Ovary on median line, small, four-lobed when fully developed; vitelline gland small, compact, dorsal to the posterior border of the ovary, becoming two-lobed; uterus; at first lobed, later occupying nearly all the interior of the proglottis, and crowding the persistent cirrus to the anterior border of the proglottis; diameter of onchospheres, so far as they can be seen in whole mounts, about 0.018 mm.

In a strobile from which the scolex is missing, measuring 13 mm. in length, rudiments of male genitalia appear in the anterior proglottides, which are 0.04 mm. in length and 0.15 in breadth. The male genitalia are mature 4 mm. from the anterior end. Rudiments of the ovary can be seen about 3 mm. farther back. The vitelline gland persists in a few proglottides after the uterus has become prominent. In the last 3.5 mm., comprising 21 proglottides, the uterus fills practically all the interior of the proglottides except at the anterior border where the long, cylindrical cirrus-pouch lies. In the preceding eight proglottides the uterus is distinctly lobed, and occupies a large part of the interior of the proglottides. The uterus in the next 12 preceding proglottides is lobed, but less and less developed anteriorly. The ovaries become inconspicuous shortly after the uterus appears, while the vitelline glands persist for about 12 proglottides after the ovaries can no longer be recognized. In an examination of serial sections the vagina was seen to begin as a short, slender tube with a sphincter muscle at its inner end. A short distance from the sphincter the vagina expands into a seminal receptacle which lies along the ventral side of the cirrus-pouch. The inner seminal vesicle communicates with the cirrus-pouch, which in large part functions as a seminal vesicle, by a short vas deferens. A portion of this inner seminal vesicle projects beyond the inner end of the cirrus-pouch, but the greater portion of it lies on the dorsal side of the cirrus-pouch. The structure of the cirrus-pouch agrees with descriptions of *H. macracanthos*. The long and filiform cirrus was clearly demonstrated in serial sections.

## RECORDS OF COLLECTIONS

From *Mergus serrator*:

(U.S.N.M., Helm. Coll. 7877.)

1887, July 1.—One, length 16.15 mm.

1913, January 1.—Twenty-five, small, maximum not much exceeding 12 mm. in length.

1913, April 11.—The vial with label of this date contains cestodes obtained from four birds, in the stomachs of which were found *Pholas*, cunners, and sticklebacks. There are very numerous small strobiles from most of which the scoleces are missing. Evidently the scoleces are rather firmly embedded in the mucous membrane, and are broken off in attempts to remove them. A piece of intestine, with worms attached, was in the vial. It was difficult to detach them without breaking them.

1913, April 17.—Numerous, small, scoleces missing.

1913, April 28.—Many, as above.

## HYMENOLEPIS PACHYCEPHALA (Linstow)

## Figures 127–130

*Scolex*.—Subpyramidal, suckers rather large; rostellum longer than scolex; hooks 10, slender, graceful, about 0.045 mm. in length.

Dimensions of scolex mounted in balsam: Diameter 0.24; breadth of sucker 0.09, length 0.10; length of rostellum 0.29. In one scolex, the rostellum of which is fully extended but with hooks missing, the rostellum tapers to a diameter of 0.03, then expands at the tip to a diameter of 0.06. The retracted rostellum lies in the elongate, vesicular sheath which extends as far, or a little farther, back than the posterior border of the suckers. In one scolex (fig. 128) the circle of hooks lay at the posterior end of the sheath with the hooks pointing forward; in other cases the retracted hooks pointed posteriorly.

*Strobile*.—Short; proglottides few and loosely attached. No proglottides in which the genitalia had begun to develop, were seen. The proglottides begin close to the scolex; they are rounded at the margins. About eight proglottides were as many as were seen distinctly in any strobile, and the posterior three or four of these were loosely attached. In those strobiles which contained as many as eight proglottides the last three or four were narrower than the first three or four.

Dimensions of formalin specimen: Length 8.68 mm.; breadth of scolex 0.17; length of rostellum 0.17, diameter 0.06; third segment, length 0.056, breadth 0.22; fourth segment, length 0.063, breadth 0.21; fifth segment, length 0.07, breadth 0.18; sixth segment, length 0.084.



breadth 0.15; seventh segment, length 0.12, breadth 0.14; eighth segment, length 0.15, breadth 0.12.

#### RECORD OF COLLECTIONS

*Colymbus holboelli*, new host:

(U.S.N.M., Helm. Coll. 7878.)

1909, January 27.—The vial contained many small scoleces, 78 counted.

1913, February 12.—Fourteen scoleces; strobiles very small and short.

#### HYMENOLEPIS PODICIPINA (Szymanski)

Figures 131–138

*Scolex*.—Small, differing in outline in mounted specimens, but in most cases rather subangular, with the suckers directed forward; rostellum short and stout, length and breadth being about equal. Dimensions in glycerine, somewhat compressed: Breadth 0.21 mm.; diameter of suckers 0.08; diameter of rostellum 0.08; length of hooks about 0.03. The hooks are rather abruptly recurved and sharp-pointed, 10 in number.

*Strobile*.—All of the strobiles in the collection are immature. They are characterized by their linear, thread-like structure, and exceedingly short and closely crowded proglottides. In a strobile mounted in balsam, and approximately 36 mm. in length, the diameter of the scolex was 0.18, diameter of neck 0.12; length of segments, 2 mm. back of the scolex, approximately 0.003, breadth 0.18; at middle of strobile length of segments approximately 0.01, breadth 0.48; near posterior end length of segments approximately 0.02, breadth 0.40. At the posterior end the strobile narrows abruptly; the narrowed portion in this case is represented by a single proglottis, length 0.08, breadth 0.18. Rudiments of genitalia appear within 5 mm., or less, of the scolex. The genital pores are unilateral, near, but not quite on the margin, near the anterior end of the proglottis. Cirrus slender, filiform; cirrus-pouch thin-walled, cylindrical, straight, and at right angles to the margin. The three testes are small and near together at the median line. The outer layer of longitudinal muscles consists of a large number of very small bundles, the inner is composed of eight bundles, four of which are ventral and four dorsal, and all much larger than those in the outer layer. The ventral excretory vessels are much larger than the dorsal; the latter show rather indistinctly in the sections, and appear to be more sinuous than the ventral vessels. The above description is based on material from *Colymbus auritus*.

## RECORD OF COLLECTIONS

*Colymbus auritus*:

1905, December 25.—Numerous scoleces with short strobiles, 1.5 mm., more or less, in length.

1906, December 8.—Three.

1914, April 16.—Numerous; most of them exceedingly filiform anteriorly, length about 40 mm.; others stouter, maximum 60 mm.

*Colymbus holboellii*, new host:

1904, February 25.—One, slender and thread-like. Length, in formalin, 22 mm.; diameter of scolex 0.22.

(U.S.N.M., Helm. Coll. 7879.)

## HYMENOLEPIS ROSTELLATA (Abildgaard)

Figures 139–142

*Scolex*.—Varying in shape, but in most cases bluntly rounded with subcircular suckers; rostellum as long, or longer than the scolex, when fully extended, more or less abruptly enlarged at the apex, which bears a single circle of 10 hooks, from 0.048 to 0.06 mm. in length. The sheath of the rostellum is conspicuous, muscular and extends into the neck. Diameter of a scolex in balsam about 0.30, of sucker about 0.14; length of everted rostellum 0.22, diameter, middle, 0.04, at apex 0.09.

*Strobile*.—There is a short neck, or unsegmented portion, which is usually narrower than the scolex. The proglottides, which begin near the scolex as fine transverse lines, remain short and closely crowded together for a greater or lesser distance. There is a great variety of forms exhibited in the strobiles. Some are rather thickish, with very closely crowded proglottides, the breadth many times the length; others are slender, filiform with proglottides becoming as long as, or longer than broad. It would appear to be impossible to regard these varying forms as belonging to the same species if it were not for the fact that similar and as great variations may occur in the same strobile. Genital pores unilateral. The walls of the genital cloaca are thick. The cirrus-pouch is large, subcylindrical, and when not curved extends nearly, if not quite, to the anti-poral excretory vessels. The three testes are relatively large, one on the poral and two on the anti-poral side of the ovary. The ovary is lobed, and may attain a breadth more than one-third that of the proglottis. The much smaller vitelline gland lies on the median line behind the ovary, is more compact than the ovary, but was seen to be distinctly lobed in some of the proglottides.

The following account of the anatomy of a proglottis is based on an examination of a series of transverse sections. The cirrus emerges

from a low papillary eminence on the inner wall of the genital cloaca. This eminence is densely covered with short spines (fig. 142). The cirrus is slender, filiform and smooth, about 0.25 mm. in length. Its diameter at base is about 0.012, whence it tapers slowly and uniformly to the tip. At a point 0.06 from the tip the diameter is about 0.007. The cirrus-pouch is subcylindrical, and extends nearly to the aporal excretory vessels. Its walls are thick and muscular, and for a considerable portion of its length it acts as a seminal vesicle. There is a capacious inner seminal vesicle, which, at least in short adolescent proglottides, lies very close to the cirrus-pouch, along the ventral side, and from a point near the anti-poral end as far as the middle of the length of the pouch. The testes are relatively large, 0.28 mm. in transverse section, one poral, and two anti-poral (fig. 141). The vagina is tubular and leads by a more or less meandering course, to a relatively capacious seminal receptacle. The ovary, situated at the median line, is small, lobulate, almost morula-like in its early stages of development. Coincident with the degeneration of the testes the ovary increases in size, and becomes broader than long. It is rather compact but lobulate, and is made up of large cells. The vitelline gland is a small but conspicuous organ, distinctly lobed in some proglottides, more compact in others.

The two longitudinal muscle layers, while well developed, are not very sharply marked off from each other. The outer layer is composed of a large number of small fascicles of irregular size and shape, which are confusedly placed as seen in transverse sections. In transverse sections through the anterior end of a proglottis this layer is close to the cuticle, but becomes separated from the cuticular region in succeeding sections. Along the inner border of the muscular layer at intervals there are larger fascicles, sub-circular in section. These fascicles represent the inner layer of longitudinal muscles. The ventral excretory vessels are relatively large, and appear somewhat triangular in cross section. The dorsal vessels are small and inconspicuous in the series of sections which was examined. They are rather variable in position, being more or less displaced by the large cirrus-pouch. The latter passes on the dorsal side of the excretory vessels.

Dimensions of different types of strobiles.

		Millimeters		
		33.00	44.00	64.00
Length.....	33.00	44.00	64.00	40.00
Diameter of scolex.....	.35		.28	.21
Diameter of sucker.....	.14		.14	.11
Length of rostellum.....	.28		.25	
Length of hooks.....	.06		.05	
Length of proglottis near posterior end.....	.08	.32	.10	.22
Breadth of proglottis near posterior end.....	1.40	.63	.39	.50

The breadth of the anterior end of the longer proglottides is less than that of the posterior end. Thus in a proglottis 0.14 mm. in length the breadth of the anterior end was 0.16, of the posterior end 0.22; in another, 0.32 in length, the breadth of the anterior end was 0.42, of the posterior end 0.63.

## RECORD OF COLLECTIONS

*Gavia immer*:

1911, July 22.—Fifty-nine strobiles and numerous fragments; length 40 mm., more or less. 1911, July 24. 1.

U.S.N.M., Helm. Coll. 7880.

1911, September 1.—One hundred and thirty.

1915, August 11.—Many.

1916, July 4.—Four with scoleces, 2 without.

*Colymbus holboellii*, new host:

1913, April 28.—One fragment of strobile, length 15 mm.

## HYMENOLEPIS TRITESTICULATA (Fuhrmann)

## Figures 143-147

Small cestodes referred to this species were found in the following hosts: red-breasted merganser (*Mergus serrator*), surf duck (*Oidemia perspicillata*), white-winged scoter (*O. deglandi*), greater scaup duck (*Marila marila*), and the American coot (*Fulica americana*).

*Scolex*.—Varying in outline, but more or less triangular, suckers relatively large, with thick borders; rostellum when fully extended slender, cylindrical, much longer than scolex, sheath of rostellum with strong muscular walls, and extending into the neck behind the scolex; hooks 10, length 0.036 to 0.039 mm., with long dorsal and short ventral root and slightly curved blade.

*Strobile*.—Neck short, the segments in most cases beginning close to the scolex; in some cases, in which the anterior end of the strobile was more or less relaxed, as if slightly macerated, the segmentation is not distinct until 0.5 to 0.7 mm. back of the scolex. There is a tendency in some strobiles to contract and thus increase the breadth near the scolex, and rarely at other points. Thus, in one, the diameter of the scolex in balsam is 0.19 mm., while the strobile immediately behind the scolex for a distance of 0.9 mm. has a breadth of 0.26. The strobiles in general are linear, increasing slowly in breadth, the proglottides as a rule remaining much broader than long. The male genitalia make their appearance early, exerted cirri having been observed 1.5 mm. back of the scolex. The genital pores are unilateral and are situated a little in front of the middle of the lateral margin. The cirrus is armed with slender spicules. It is more or less club-shape, and, when fully everted, a slight bulbous enlargement may appear (fig. 147). The cirrus shown in this figure

measured 0.135 mm. in length, 0.015 in diameter at base, 0.018 at the bulbous enlargement and at the tip, and was 2.5 mm. back of the scolex. The cirrus-pouch is long, slender, cylindrical, at first reaching to or beyond the median line; later it may become somewhat curved, or spiral; its walls are thick, and appear to be made up of longitudinal muscles. Its inner portion functions as an outer seminal vesicle. An inner seminal vesicle was seen near the median end of the cirrus-pouch, and connected with it by a short vas deferens. In some of the younger proglottides this inner seminal vesicle was relatively large. Thus the diameter of an inner seminal vesicle was 0.054 mm., the diameter of the adjacent cirrus-pouch being 0.042. Only male genitalia appear in the anterior part of the strobile. The three testes are small with circular outlines and placed near together nearly in a straight line, the one nearest the antiporal margin of the proglottis being a little in advance of its neighbor. This observation was made on a proglottis 0.03 mm. in length and 0.24 in breadth; the diameter of a testis was 0.024. The vagina lies along the ventro-posterior border of the cirrus-pouch; a seminal receptacle was faintly shown near the median line. The ovary was not clearly shown in the mounted specimens. It appears to be small and rather compact, but where best seen somewhat unsymmetrical with reference to the median line, and more or less lobed (fig. 146). The vitelline gland was compact and not lobed. The uterus, beginning as a small tube on the ventral side of the ovary, develops rapidly in succeeding segments, and ultimately occupies practically all of the medullary space. In ripe portions of some strobiles the septa between the proglottides are indistinct, so that the relatively large ova appear to be continuous from one proglottis to another. Diameter of onchosphere 0.030 to 0.036 mm., length of embryonic hooks 0.012. Dimensions, life: Length 10; diameter of scolex 0.32, length 0.32; diameter of sucker 0.14; length of exerted rostellum 0.20, diameter at base 0.08, middle 0.03, tip 0.08; breadth of neck 0.20; distance to first segment 0.080, length of first segment 0.02, breadth 0.22; length of last segment 0.24, breadth 0.30. Length of longest strobile mounted in balsam 24 mm. Dimensions of mounted specimens: (1) Length 9; breadth of scolex 0.24, length 0.16; breadth of sucker 0.10, length 0.12; length of rostellum 0.18; length of sheath 0.18; length of posterior segment 0.14, breadth 0.24. (2) Length 24; breadth of scolex 0.19; breadth of sucker 0.11; length of posterior segment 0.14, breadth 0.49. Further details are given under records of collections.

The foregoing account is based on material from *Marila marila*, new host. Following are notes on material from the other hosts in which this species was found:

From *Fulica americana*, new host. The ripe proglottides, in all cases, were much broader than long. Thus, in a fragment of strobile, in which all the proglottides are filled with the relatively large ova, and the septa between the proglottides are not distinguishable, the length of a single proglottis was 0.07 mm. and the breadth 0.70. The cirri were nearly cylindrical, 0.09 to 0.10 in length, 0.012 in diameter at base, and 0.015 near the tip, whence they tapered to a short, acute to acuminate, point. They were spinous except at the tip. The largest fragment is about 12 mm. in length. There are a few immature strobiles which appear to belong to this species. One of these, about 3.5 mm. in length, is lanceolate; diameter of scolex 0.18; strobile increasing in breadth gradually from about 0.10 to a maximum of 0.28, which is at a point 0.4 from the posterior end. The segments are short, nowhere more than 0.015 in length, until near the posterior end; penultimate segment, length 0.045, breadth 0.126; posterior segment, length 0.06, breadth 0.105. The length of the hooks on all the scoleces but one was about 0.033; on one they were about 0.029 in length.

From *Mergus serrator*, new host. A few short fragments, the anterior ends of strobiles, maximum length 4 mm. Length of hooks 0.036 mm.; cirri spinose, somewhat clavate, bluntly rounded and smooth at the apex; breadth of scolex 0.15 to 0.20.

From *Oidemia deglandi*, new host. Length of hooks 0.033 mm. Cirri, when fully exerted and not collapsed, usually about 0.12 in length, with a diameter of from 0.012 to 0.018; but in one strobile the maximum length of a cirrus was 0.16 and the maximum diameter 0.033. Where best seen the cirrus is characterized by having a cylindrical base covered with minute spines which are less crowded distally where the cirrus becomes slightly swollen; beyond this point it is usually clavate, with slender spines which become shorter toward the tip, where they are very minute. The anatomy of a proglottis, as shown in sections, agrees with the foregoing. The ovary in some transverse sections was dumb-bell shape, and was composed of distinct, subangular cells. The dorsal and ventral excretory vessels lie close together, and the cirrus-pouch and vagina pass on the dorsal side of the poral pair. The musculature was not well shown in the sections. There appeared to be but a small number of longitudinal muscle bundles.

From *Oidemia perspicillata*, new host. Strobiles all small and immature, agreeing with immature strobiles from *O. deglandi*. There is a tendency to assume a slightly fusiform shape. At the posterior end there is usually a longer or shorter portion where the proglottides are moniliform. Length of hooks 0.036 mm.

## RECORD OF COLLECTIONS

*Marila marila:*

(U.S.N.M., Helm. Coll. 7881.)

1887, August 23.—Two, length 10 to 10.5 mm.

1914, February 19.—Eight, longest 15 mm.

1914, February 26.—About 43 strobiles, few with scoleces, maximum length 45 mm.

1914, February 28.—About 20 strobiles, small.

*Fulica americana:*

1920, November 20.—Six scoleces and a few fragments of strobiles. Collected by Robert A. Goffin.

*Mergus serrator:*

1913, January 1 and April 11.—Few, associated with numerous examples of *H. macracanthos*.

*Oidemia deglandi:*

1887, August 29.—Both large and small taenioids collected on this date agree in the character of the scoleces, including the hooks, and in the anatomy of the proglottides. The maximum length was 150 mm. A small strobile measured 6 mm. in length; diameter of scolex 0.17.

1911, July 3.—Numerous, length of strobiles not exceeding 10 mm.; posterior ends of longest moniliform, with a few segments loosely attached.

1913, August 14.—Numerous, 2,000 (estimated); length 16 mm., more or less.

1913, September 4.—Very numerous, as above.

1913, November 4.—Many; length about 7 mm.; strobiles more or less arcuate; three birds examined, worms in two.

1916, October 18.—Approximately 500; length 7 mm.

*Oidemia perspicillata:*

1913, May 8.—Few, 5 to 12 mm. in length.

1913, July 12.—Large numbers with scoleces embedded in mucous membrane of intestine; 1,267 counted; all small, 4 mm., more or less.

## HYMENOLEPIS (WEINLANDIA), species

Figures 148-152

A few taenioids from *Marila marila*, and *Oidemia deglandi*, while possibly not belonging to the same species, have many points of resemblance, especially in the shape and arrangement of the hooks which closely resemble those of *Hymenolepis anceps*, new species from *Mergus serrator*.

(1) Among the taenioid cestodes found in *Oidemia deglandi* (U.S.N.M., Helm. Coll. 7882), most of which have been referred to *H. tritesticulata*, there are a few fragments of strobiles, one strobile with the scolex missing, and one scolex with about 12 mm. of

strobile, immature, which belong to a different species. While it is not quite certain that these fragments belong to the same species as that represented by the one scolex, there appears as yet to be no reason for regarding them as specifically different.

*Scolex*.—The rostellum (fig. 150) is short, its diameter nearly equaling the length. It is surmounted by a single circle of about 18 hooks, which are short and strongly curved, about 0.010 mm. in length (fig. 151).

*Strobile*.—The neck, at first about the same breadth as the scolex, grows slightly narrower a short distance behind the scolex. Distinct segments do not appear until about 1.6 mm. back of the scolex. The proglottides are sharply outlined, and the lateral margins of the strobile are distinctly serrate. Rudiments of genitalia have made their appearance in the posterior proglottides. While rudiments of the cirrus have not yet appeared, the indications are that the genital pores are unilateral.

A strobile, scolex missing, agrees with the fragment above described. The segments at the anterior end are at the same stage of development as those at the posterior end of the fragment with scolex. The posterior segments are adult (fig. 152), but no ova have yet appeared. There are three relatively large testes, two antiporal and one poral. The antiporal testes are contiguous, one being situated at the antero-median border of the other. The ovary is lobed, the vitelline gland, small, subtriangular in outline, and compact. Genital pores unilateral; cirrus not seen extruded. It appears to be short, the principal part of the cirrus-pouch acting as a seminal vesicle. In dorso-ventral view the cirrus-pouch appears to be oblong-elliptical in outline. In other fragments of strobiles, apparently belonging to the same species, seen in marginal view, the cirrus-pouch as a whole is much curved, in some cases S-shaped.

Dimensions of fragment of strobile with scolex: Length 12 mm.; diameter of scolex 0.18, of sucker, 0.08; length of rostellum 0.06, length 0.054; length of hooks 0.010; length of last segment 0.08, breadth 0.36.

Dimensions of strobile, scolex missing: Length 54 mm.; length of anterior segments 0.08, breadth 0.28; length of median segments 0.11, breadth 1.15; length of posterior segments 0.16; breadth 1.22.

This material belongs to the lot collected by Vinal N. Edwards on November 4, 1913.

(2) A single specimen collected from *Marila marila*, August 23, 1887 (U.S.N.M., Helm. Coll. 7883) is here recorded. But little more than an outline of the somewhat compressed scolex can be made out in the mounted specimen; even the suckers are too faintly shown to permit measurement. They have been added to the camera lucida sketch (fig. 148) from a memorandum sketch made at the time of



collecting. The rostellum is short and broad; the hooks, 10 or 12 in number, are 0.015 mm. in length (fig. 149).

Measurements made at the time of collecting, specimen slightly compressed: Length 12 mm.; diameter of scolex 0.22, length 0.22; diameter of rostellum 0.08; diameter of neck 0.10; distance to first distinct segment 0.12; length of first distinct segment 0.02, breadth 0.16; length of last segment 0.12, breadth 0.60; length of fourth from last segment 0.09, breadth 0.90; number of segments 250.

#### HYMENOLEPIS, species

##### Figures 153-156

Among the cestodes collected by Vinal Edwards is a small lot from *Larus delawarensis*, collected January 24, 1914, U.S.N.M., Helm. Coll. 7884. My note made at the time of a preliminary examination of the formalin material is: Slender cestodes with distinct segments; diameter of scolex 0.45 mm.; numerous short fragments from 10 to 15 mm. in length; longest strobile, scolex missing, 50 mm.

The mounted material comprises two scoleces and six fragments of strobiles which represent two strobiles 30 and 44 mm. in length respectively. The proglottides are all immature.

*Scolex*.—Somewhat pyramidal, rostellum longer than scolex, tapering to the middle of its length, enlarged at the apex, which bears a single crown of 10 hooks, 0.054 to 0.060 mm. in length. The hooks have long dorsal and short ventral roots, blade but slightly recurved, and are longer and less slender than those of *H. ductilis* from the herring gull.

*Strobile*.—There is a short neck, about as long as the scolex. For a short distance the segments are closely crowded, but soon become distinct, and, in places, as long, or even a little longer than broad. Throughout the greater part of the strobile the proglottides have abruptly flaring posterior borders. Near the posterior end of each strobile the proglottides are, for a short distance, crowded and much broader than long. Only rudiments of the genitalia have developed, but are sufficient to show that the genital pores are unilateral and near the anterior end of the proglottis.

Dimensions of larger specimen in balsam: Length 44.00 mm.; diameter of scolex 0.32, of sucker 0.14; length of rostellum 0.25, of hooks 0.054; breadth of neck 0.19; length of proglottides 0.5 mm. from scolex 0.015, breadth 0.18; length near middle of strobile 0.15, breadth 0.21; length 1 mm. from posterior end of strobile 0.08, breadth 0.42; length of last proglottis 0.15, breadth 0.26.

## HYMENOLEPIS, species

Figures 157-159

In a small lot of cestodes, collected by Robert A. Goffin, Nov. 20, 1920, from *Fulica americana* (U.S.N.M., Helm. Coll. 7885,) one small strobile differs from the others, which have been referred to *H. tritesticulata*.

*Scolex*.—Subtriangular in outline; suckers oval, a little longer than broad; sheath of rostellum pyriform, extending a little way back of posterior margin of the suckers; hooks (fig. 158) 10 in number and about 0.036 mm. in length, with conspicuous air spaces.

*Strobile*.—Neck very short, narrower than scolex; first segments very short; rudiments of genitalia appear as early as the segments; Mature cirrus-pouches appear about 1.25 mm. back of the scolex; cirrus-pouch short-fusiform, with thick muscular walls, more or less curved; in some the convex side is anterior, in some posterior, others are more or less curved dorso-ventrally. The genital pores are unilateral, and near the anterior border of the proglottis. The cirrus is smooth, slender, filiform, almost spiculate; when fully everted it is seen to issue from a short, subconical base (fig. 159). Length of cirrus-pouch 0.012, diameter 0.04. The genitalia are not very clearly shown in the mounted specimen. The three globular testes, about 0.021 mm. in diameter, are placed in a horizontal line near the posterior margin of the proglottis, two of them in contact with each other at the median line, the other slightly removed toward the antiporal margin. There is a seminal vesicle near the inner end of the cirrus-pouch. Vagina not satisfactorily shown; ovary not distinct, but appears to be relatively small, slightly lobed, the larger part of it on the antiporal side of the median line; uterus somewhat tubular in ventro-posterior part of proglottis, later it occupies the greater part of the medullary space.

Dimensions, in balsam: length 5.6 mm.; breadth of scolex 0.19; length of sucker 0.114, breadth 0.084; maximum diameter of sheath of rostellum 0.075; distance to first segment 0.09, length 0.006, breadth 0.11; length of cirrus-pouch 0.09 to 0.12, maximum diameter 0.03 to 0.04; cirrus, basal portion, length 0.012, breadth 0.012, slender portion, length 0.045, diameter 0.004; posterior segments, length 0.10, breadth 0.28.

## RHABDOMETRA SIMILIS (Ransom)

Figures 160-163

*Scolex*.—The shape of the scolex varies somewhat, due to different states of contraction when fixation took place. In most cases it is

rounded in outline, the suckers nearly circular and but little prominent. There is a short rostellum surmounted by a double circle of very short hooks. Their exact number was not satisfactorily made out, but there appear to be in the neighborhood of 40, (this from notes made on fresh material); in the mounted material the number of hooks appears to be less than this estimate, and they are so closely crowded that there appears to be but a single circle; the length is about 0.01 mm.

*Strobile*.—There is a neck which, as a rule, is considerably longer than the scolex. One case was observed in which the distance to the first segments was about equal to the length of the scolex, the short neck being of about the same diameter as the scolex. In the other strobiles the diameter of the neck was less than that of the scolex. The segmentation begins gradually, the first segments being much broader than long. The segments lengthen until, toward the posterior end of the strobile, they are longer than broad. The segments overlap but slightly, and the breadth of the anterior end is less than that of the posterior, except at the posterior end of the strobile, where they may be nearly linear, the extreme posterior segment being rounded and slightly narrowed at the posterior end. The genital pores are irregularly, alternate, and situated near the anterior fourth of the lateral margin. The cirrus is short and apparently smooth. The cirrus-pouch is small; in a transverse section of a ripe proglottis its diameter was 0.045 mm., in another 0.051. There are 12 or more testes. The exact number could not be made out in the mounted specimens, and my sections proved to be made through ripe proglottides, in which, although a few testes remained, no estimate could be made from them of the number in a mature, unripe proglottis. The diameter of a single testis in these sections was about 0.05 mm. The vas deferens, as seen in a ripe proglottis, extends from the cirrus-pouch antero-medial to the median line, where there was a remnant of what appeared to be a coiled mass of the vas deferens, near the anterior end of the proglottis, immediately in front of the para-uterine organ.

The female genitalia were made out only in part. As seen in the whole mount of a ripe proglottis (fig. 162), the vagina, opening at the posterior side of the cirrus, in the genital cloaca, can be traced in a diagonal line postero-medial, to a point near the wall of the uterus. Little is shown of its structure, but there is an indication of a slight enlargement into a seminal receptacle. The uterus in most of the ripe proglottides is an elongated sac lying on the median line, and preceded by the para-uterine organ. The latter is filled with dense fibrous tissue. The eggs are oval, with thin membranous shells. The longer diameter of the onchosphere is about 0.03 mm.

Transverse sections of ripe proglottides agree in detail with figure 24 of Ransom's description of *R. similis*.<sup>3</sup> Longitudinal muscles are but feebly developed, and no circular muscles were seen.

Although these worms are smaller than the type, and there is, moreover, a crown of hooks on the scolex, which has not been noted in this genus, I prefer, on account of the very close resemblance presented by the anatomy of adult and ripe proglottides, to refer them to *R. similis*.

#### RECORD OF COLLECTION

##### *Coccyzus americanus*:

1906, June 14.—The taenioids here described were collected from a male yellow-billed cuckoo, found dead on the college campus, Washington, Pa. The stomach contained 20 caterpillars, and jaws and legs of beetles. There were 30 strobiles with scoleces, and many fragments of strobiles, consisting of ripe segments. These fragments were of a brick-red color. The worms remained active for some time in normal salt solution. Maximum length, 20 mm. Other dimensions: Breadth of scolex 0.32, of sucker 0.10, of neck 0.20; distance to first segments about 0.30; length of posterior segments 1.12, breadth 0.80. Three ripe proglottides, still attached to each other, had the following dimensions: (1) length 2.72, breadth 0.56; (2) length 3.20, breadth 0.64; (3) length 1.60, breadth 1. These proportions were changing, due to the contraction and relaxation of the proglottides.

(U.S.N.M., Helm. Coll. 7886.)

#### DIORCHIS ACUMINATA Clerc

Figures 164-173

*Scolex*.—Subject to some contraction variations, but in most cases abruptly truncate, with suckers directed forward; rostellum elongate, subcylindrical, enlarging at apex, which is surmounted by a crown of 10 hooks. The hooks are characterized by having the long dorsal root slightly curved; length about 0.05 mm. Hooks occur on the suckers, but on account of their small size are not easily seen.

*Strobile*.—Slender throughout; proglottides very closely crowded together, beginning as transverse striae a short distance back of the scolex. Rudiments of genitalia appear near the scolex, and develop slowly, although mature male genitalia may appear early; see figure 166, which was sketched from a point less than 1.5 mm. from the scolex. The cirri are slender, armed with straight, bristle-like

<sup>3</sup> Bulletin 69, U. S. National Museum, p. 32.

spines, rather sparsely set, and have a bulbous enlargement near the base (fig. 167). The cirrus-pouch is elongate, cylindrical, its walls largely composed of longitudinal muscles; the inner half, or more, of its length acting as a seminal vesicle. An inner seminal vesicle lies on the dorsal side of the inner end of the cirrus-pouch, which communicates with the two testes by what appear in my sections to be relatively large vasa efferentia. The vagina, ventral, parallel, and very similar in appearance to the cirrus-pouch, leads to a capacious seminal receptacle. The ovary, vitelline gland, testes, and inner seminal vesicle are massed together along the median line, and are difficult to interpret in whole mounts. The proglottides are very short, their length in some portions of the strobile being less than the axial diameter of ovaries and testes. Thus, in a portion of a strobile where the length of the proglottides was 0.15 mm., the antero-posterior diameter of testes and ovaries was from 0.16 to 0.21. The ovary is lobed, and is ventral to the small, compact vitelline gland. The uterus varies greatly in different parts of the strobile. In earlier proglottides it is more or less lobed; in ripe proglottides it occupies the greater part of the interior. The ova are fusiform (fig. 171). The central excretory vessel is much larger than the dorsal, and has thinner walls. The dorsal and ventral vessel of each pair lie close together, and the genital ducts pass on the dorsal side of the poral pair.

There are two layers of longitudinal muscles, an outer, consisting of a large number of small bundles, oval-elliptical in transverse section, and containing a maximum of about six fibers, and an inner, consisting of eight bundles, which are much larger than those in the outer layer. The number of fibers in the inner bundles is variable; as many as 30 were counted in one of them.

#### RECORD OF COLLECTIONS

*Marila americana*, new host:

1914, February 19.—Four strobiles, two with scoleces; slender, segments indistinct in all but one, filiform, thickish; longest measured 176 mm.; maximum diameter 1.5; breadth of scolex 0.42, of neck 0.37; diameter of rostellum at apex, 0.09. Diameter of another scolex 0.27, of rostellum 0.07; number of hooks in each 10, length 0.05.

(U.S.N.M., Helm. Coll. 7887.)

1914, February 26.—Three strobiles, scoleces missing, slender, filiform; segments indistinct; lengths, 140, 143, 184.

1914, February 28.—Number not recorded; length of one 30 mm., breadth of scolex 0.33 mm.

## VALIPORA, new genus

*Dipylidiinae:*

Rostellum armed with a single crown of hooks, 0.01 to 0.03 mm. in length, with long dorsal and short ventral roots. Genital pores unilateral; genital cloaca with strong muscular walls. Genital ducts pass between the longitudinal excretory vessels. Testes 12 to 25, or more, posterior or lateral to ovary. Uterus saclike, lobed, but filling the medullary space in ripe segments.

The cestodes here placed have many characters which ally them to the genera *Lateriporus* Fuhrmann, and *Monopylidium* Fuhrmann.

*Type of genus.*—*Valipora mutabilis*.

## VALIPORA MUTABILIS, new species

Figures 174-181

The cestodes from the night heron, here considered, appear to belong to the same species. There is considerable variation, particularly in the form of the ovary and uterus in proglottides of different stages of development and in the shape of the proglottides themselves, but in some of the longer strobiles there is as great variation in these respects in a single strobile as was observed in different strobiles.

*Scolex.*—The mounted specimens exhibit a variety of contraction shapes, and there is considerable difference in dimensions. The following dimensions are averages of five scoleces: Length 0.11 mm., breadth 0.18; sucker, length 0.10, breadth 0.075. The rostellum was retracted in all cases, and the number of hooks was difficult to determine. There appear to be 10; length 0.03 mm. The hooks are slender, straight, and rather abruptly recurved at the tip.

*Strobile.*—Measurements of the living worm gave a maximum length of about 20 mm. A few strobiles which had been placed for a short time in fresh water extended to more than twice that length. The longest mounted specimen measures approximately 35 mm. in length. In normal strobiles the breadth of the neck is about 0.06. Segments begin near the scolex. At first much broader than long, the proglottides increase slowly in length and breadth, but remain much broader than long. The posterior edge overlaps the succeeding segment, so that the cirrus-pouch of the succeeding segment is nearly or quite covered by the overlapping border of the preceding segment. In a strobile measuring about 15 mm. in length, at a point 2 mm. back of the scolex, the segments are 0.06 in length and 0.14 in breadth; at the middle of the strobile they are 0.10 in length and 0.18 in breadth; near the posterior end the length is 0.11, and the breadth 0.56; the posterior two or three segments were 0.21 in length and 0.54 in breadth. These proglottides were adult but not ripe. Length

of ripe proglottides, in which the uterus occupies the greater part of the interior, 0.23, breadth, anterior 0.35, posterior 0.60. In strobiles which had been placed in fresh water before fixation, the proglottides presented a great variety of shapes, exhibiting a tendency to lengthen and become more or less campanulate. Thus, at one point a proglottis has the following dimensions: Length 0.29 mm., breadth, anterior 0.14, posterior 0.32; the third segment back of this, length 0.15, breadth, anterior 0.35, posterior 0.42; the sixth segment back of the latter, length 0.32, breadth, anterior 0.17, posterior 0.34; ripe segments, length 0.39, breadth, anterior 0.28, posterior 0.53.

The genital pores are unilateral and situated in front of the middle of the margin. The cirrus is long, slender, and smooth. The cirrus-pouch has thick muscular walls, and has a tendency to press against the marginal wall so as to make a protruding bulge in the outline of the lateral margin. The cirrus-pouch extends antero-medial, and coils of the vas deferens lie at the median line near the anterior border. The exact number of testes was not made out, but they appear to be at least 12 in number. They lie dorsal to the ovary and extend somewhat beyond its posterior and lateral borders. The ovary, while presenting a variety of appearances in proglottides of different stages of development, becomes more or less lobed (fig. 177). It lies ventral to the testes, and the relatively small and compact vitelline gland lies immediately posterior to it. The uterus differs markedly in appearance even in adjacent proglottides. As it matures it becomes profoundly lobed (fig. 180). Ultimately the lobes become indistinct and the uterus comes to occupy practically all the interior of the proglottis. So far as can be made out the eggs are oval, with thin, membranous shells, the diameter of which is at least as much as 0.036 mm.; diameter of onchosphere 0.018.

The longitudinal muscles are not sharply set off into two layers, but the fascicles on the medullary side are fewer and larger than those on the cuticular side, as in *V. parvispine* (fig. 187).

The genital ducts pass between the longitudinal excretory vessels. The latter are indistinct in most of the sections. The dorsal vessel is minute, the ventral vessel much larger. In one series of sections the lumen of a ventral vessel, crowded by the gravid uterus and with collapsed walls, measured 0.018 by 0.003 mm. in the two principal diameters; the lumen of the dorsal vessel was about 0.002 mm. in diameter.

#### RECORD OF COLLECTIONS

##### *Nycticorax nycticorax naevius*:

1905, October 19.—Few, small, no scoleces.

1906, September 26.—Fragments of strobiles; no scoleces.

1906, September 28.—Several fragments, with at least one scolex.

- 1908, September 1.—Several fragments of strobiles, three scoleces.  
1913, May 7.—A few fragments of strobiles.  
1913, May 14.—Fifty-two; maximum length about 16 mm.  
1913, May 15.—Sixteen strobiles, small; two with scoleces.  
1913, May 16.—Five, maximum length 36 mm.  
1913, May 20.—Three small strobiles, no scoleces.  
1914, September 9.—Six, length about 12 mm., scoleces missing.  
1914, September 23.—Small pieces of strobiles, no scoleces.  
1922, July 17.—Three hundred, more or less; longest, in sea water, about 20 mm.  
U.S.N.M., Helm. Coll. 7888 (type).

**VALIPORA PARVISPIKE, new species**

Figures 182–187

*Scolex*.—Subject to some variation due to different degrees of contraction, but usually broader than long with relatively large suckers; rostellum not seen fully everted, but evidently tapering and enlarging but little at the tip; hooks, about 20, appear to be in a single circle, and of the same size and shape, length 0.010 to 0.012 mm. Average breadth of 7 scoleces mounted in balsam was 0.50, length 0.29, diameter of sucker 0.28.

*Strobile*.—The neck is short and of varying breadths, depending on the conditions of contraction. In some cases it is as broad immediately behind the scolex as the scolex itself; in others there is a constriction behind the scolex followed by an abrupt enlargement, which may be as broad as the scolex and of about the same length; in some cases the region of first proglottides is as broad as the unsegmented portion, or neck; in others it is much narrower. In most cases the anterior end of the strobile is characterized by having the proglottides closely crowded. There is often considerable variation in the shape of the proglottides in different regions of the strobile. The most usual shapes, perhaps, are those shown in figure 184, but portions of the same strobile may have the proglottides more or less campanulate or cuneate. Thus, in the strobile of which figure 182 is a sketch of the scolex, the condition shown in the sketch is maintained for a distance of about 1 mm., the length of the segments about 0.04 mm. This is followed by a short portion in which the segments are closely crowded and under 0.03 mm. in length. Following this the segments lengthen and assume outlines like those in figure 184. Then come some half dozen segments that are wedge-shape; a typical segment measured 0.49 mm. in length, breadth at anterior end 0.14, at posterior end 0.30. This is succeeded by a succession of segments much like those shown in



the sketch, which continue for the remainder of the length, about two-thirds of the total length, except where interrupted at one place, where about four segments are elongated and wedge-shape. The genital pores are unilateral. They are surrounded by a strong muscular cloaca, and are situated toward the anterior end of the proglottis. Dimensions of a specimen mounted in balsam: Length 42 mm.; breadth of scolex 0.47, of sucker 0.28; length of posterior segment 0.10, breadth 0.63.

*Anatomy of proglottis.*—The genital cloaca has strong muscular walls; at the posterior side of the cloaca the cirrus and vagina open near together. The cirrus pouch is cylindrical and passes antero-medial from the genital pore. The vas deferens is voluminous at the median end of the cirrus-pouch, and a part of it is enclosed in the cirrus-pouch. The number of testes was not determined, but there appeared to be as many as 25 in some transverse sections of immature proglottides. The vagina is nearly the same size and shape as the cirrus-pouch and lies nearly parallel to it on its ventral side. It extends a little nearer to the median line than the cirrus-pouch and appears to act, for the most part, as a seminal reservoir; the germ duct arising from its inner end is short and sinuous. It was traced in transverse sections of immature proglottides to the dorsal side of the ovary and the poral border of the vitelline gland. The ovary is situated in the antero-medial region, and both it and the vitelline gland are lobed. The ovary appears to be a single but finely lobed gland, and the vitelline gland, a much smaller and more compact organ, lies just behind the ovary on the median line.

In one series of transverse sections the longitudinal muscle layer was poorly developed. Another series was made through a region of immature proglottides. In these the fascicles have a somewhat two-layered arrangement, and the inner fascicles are as a rule larger and contain coarser fibers than do the outer fascicles (fig. 187). Circular muscles were not seen.

The relatively small dorsal and ventral excretory vessels lie near together except when, on the poral side, they are separated by the cirrus-pouch and vagina.

Some of the sections contained large numbers of calcareous bodies.

#### RECORD OF COLLECTIONS

##### *Gavia immer*:

(U.S.N.M., Helm. Coll. 7889 (type).)

1911, July 22.—Strobiles long and filiform; only two scoleces seen, but fragments of strobiles aggregating 70 centimeters found; all filiform and practically of the same diameter throughout.

1911, July 24.—Five.

1911, September 1.—Some of the slender strobiles noted but no scoleces seen.

1914, February 21.—Few; length of longest 60 mm.; maximum breadth 0.38; diameter of scoleces 0.31 to 0.53 (formalin).

1916, July 4.—Over 214 with scoleces, and at least as many strobiles from which the scoleces were missing. Most of the mature strobiles from 25 to 40 mm. in length; one, much attenuated, 85 mm. in length; diameter of scoleces 0.56, or more; maximum breadth of strobile 1 mm.

#### DIOICOCESTUS FUHRMANNII Linton

Examples of this separate-sexed cestode were collected by Vinal N. Edwards in the Woods Hole region from two species of grebe.

Fuhrmann noted as a characteristic of the different species of this genus that a male and a female strobile are always to be found together.

As was noted in the original description of this species,<sup>4</sup> the same characteristic is indicated by most of the material in this collection. There are, however, two dates on which a single specimen is recorded. In the absence of detailed notes made at the time of the preliminary examination of the material these records should be regarded as incomplete. In all cases where two strobiles can be referred without doubt to the same host, the female is the larger.

#### RECORD OF COLLECTIONS

From *Colymbus auritus*:

1913, April 28.—One female strobile; length 190 mm., maximum breadth 8.5 mm., maximum thickness 4.5 mm. Sections were made of the posterior end of this strobile. The seminal receptacles were found to be full of sperm cells, thus indicating that at least one male strobile had been present in this host contemporaneously with the female strobile which was collected.

*Colymbus holboellii*:

(U.S.N.M., Helm. Coll. 7890.)

1904, February 24.—Two birds examined; two strobiles; lengths 196 and 164 mm., respectively; maximum breadths 5 and 3 mm., respectively.

1904, February 25.—Two strobiles; length 264 and 140 mm., maximum breadths 6.5 mm.

1904, March 5.—Two birds examined; four strobiles; length 132, 45, 245, and 94 mm., maximum breadths 7.5, 7, 8, and 8 mm.

<sup>4</sup>Journal of Parasitology, vol. 11, pp. 163-169.

- 1904, December 13.—Two strobiles; lengths 60 and 108 mm., maximum breadths 10.5 and 7.5 mm.
- 1906, December 8.—Two strobiles, 120 and 135 mm. in length, and a fragment 50 mm. in length; maximum breadth 8 mm.
- 1910, January 12.—Two strobiles; length 167 and 113 mm.; maximum breadth in each 6 mm., and thickness 3 mm. The shorter specimen was in two pieces, one, with scolex, 28 mm. in length.
- 1910, January 13.—A vial with label of this date contained a fragment, lacking the scolex, length 120 mm., breadth 9 mm.
- 1913, February 12.—Two strobiles, 120 and 65 mm. in length; maximum breadth 7 and 6.5 mm., thickness 3 and 3.5 mm.
- 1913, February 18.—One strobile, length 110, maximum breadth 6, thickness 3 mm.
- 1913, April 28.—Two birds examined; lengths of strobiles recorded, 172, 130, 110, 95, and 40 mm. One of these was probably a fragment. These specimens were combined with others before the generic status had been recognized.

DIPLÖPOSTHE LAEVIS (Bloch, 1782), Jacobi, 1896

Figures 214-221

*Scolex*.—Missing.

Anterior mature proglottides from nearly as long as broad to about half as long as broad; ripe proglottides from four to five times as broad as long; lateral margins somewhat rounded, giving a crenulate outline to the strobile.

Genital pores on each lateral margin at about the middle of the length of the proglottis; cirri two to each segment, one on each side, stoutish and densely beset with minute spines, which are slender, and nearly straight, only slightly curved at the tip; cirrus-pouch thick-walled, somewhat fusiform. Testes three, relatively small, near together at the posterior end of the proglottis behind the female genitalia. They are limited to the earlier portion of the strobile. The two seminal vesicles are capacious, somewhat tubular, their inner ends near together at the median line at the dorsal border of the ovary. Each communicates with its cirrus-pouch by a short vas deferens. The cirrus-pouches extend antero-medial from the genital pores.

The vaginae appear in the whole mounts as thin-walled tubes with somewhat irregular outlines, posterior to the cirrus-pouches. The ovary is profoundly lobed, differing in the number and shape of the lobes in the different proglottides. In general it is somewhat crescent shaped, inclosing the shell-gland, and, in some cases, partly inclosing the vitelline gland. In some of the proglottides the posterior lobes of the ovary are ventral to the vitelline gland. The

vitelline gland is also lobed but the lobes are shorter and blunter than those of the ovary. The uterus in ripe proglottides occupies the greater part of the interior of the proglottis, the ova lying in several rounded masses, showing that the uterus is more or less lobed.

The sections which were made proved to be all of ripe proglottides. In these the musculature appears to be comparatively weak. The longitudinal muscles were represented by an outer layer of very small fascicles which is continuous, except where broken by the genital ducts. There are also a few small fascicles of an inner layer of longitudinal muscles in the median region of the proglottis.

The two ventral longitudinal excretory vessels are relatively large; the dorsal vessels, while somewhat variable, are very much smaller than the ventral vessels. In some sections they are minute and difficult to recognize. Usually they lie near the ventral vessels on the median side.

#### RECORD OF COLLECTION

*Marila americana*, new host:

1914, February 26.—Six fragments of strobiles, maximum length about 30 mm. The broadest of these fragments measured in formalin, 4.5, the narrowest about 2.5 mm.

(U.S.N.M., Helm. Coll. 7891.)

#### GYROCOELIA MILLIGANI, new species

Figures 188–193

The material upon which this description is based consists of one slide containing one scolex and fragments of strobile aggregating about 24 mm., one slide of frontal, one of sagittal, and two of transverse sections.

*Scolex*.—Broader than long, suckers a little longer than broad; rostellum enlarged at the tip, hooks missing; the extended rostellum and its sheath form a pestle-shaped structure. Diameter of scolex 0.22 mm., of sucker 0.11, of rostellum at middle 0.042, at apex 0.056; distance from base of sheath to apex of rostellum 0.22.

*Strobile*.—The neck is short and the proglottides begin abruptly; posterior breadth of proglottides greater than anterior, making the lateral margins of the strobile strongly serrate. Genital pores irregularly alternate at about the middle of the margin. There is a tendency in parts of the strobile for the genital pores to be at the summit of a papillary projection of the lateral wall of the proglottis. The cirrus-pouch is somewhat fusiform, with the median end tapering to a blunt point, producing in some cases a conical rather than a fusiform shape. In mature proglottides the length of the cirrus-

pouch was from 0.45 to 0.56 mm. and the maximum diameter 0.15. Its walls are strong, with spirally arranged muscles. The inner portion incloses portions of the vas deferens (fig. 191). In sections of ripe proglottides the cirri were missing, as if lost in the act of copulation. In sections of adult unripe proglottides the cirri were retracted. So far as they could be made out they seem to have rather collapsible walls and are densely covered with minute spines 0.012 to 0.015 mm. in length. In a proglottis 1.33 mm. in breadth, the length of the cirrus-pouch was 0.53, length of the cirrus 0.24. The cirrus-pouch passes between the two lateral excretory vessels. The vitelline gland lies on the median line near the posterior edge of the proglottis. In a frontal section of a proglottis 0.28 mm. in length and 0.84 in breadth, the vitelline gland was 0.045 in length and 0.12 in breadth. In a transverse section of a proglottis 1.08 in breadth the thickness of the vitelline gland was 0.075, the breadth 0.14. The gland is compact, with short, blunt lobes. The ovary lies anterior to the vitelline gland, and in adult proglottides its breadth is approximately one-third that of the proglottis. A small empty space dorsal to the vitelline gland was interpreted to be the seminal receptacle. No trace of vagina was seen in any of the sections. The number of testes was not determined. They are few and small and medially situated, dorsal to the ovary, and, together with the vas deferens, posterior to the inner end of the cirrus-pouch.

• The excretory vessels in each lateral pair lie close together; the ventral is only a little larger than the dorsal, and there is a transverse vessel at the posterior end of the proglottis connecting the two ventral vessels.

• There are two layers of longitudinal muscles, each layer containing a large number of muscle bundles, 80, more or less, in the outer layer, and a somewhat smaller number in the inner. The size of the bundles is variable in each layer, but there is not much difference between the average size of the bundles of the two layers. The bundles are subcircular in cross-section; individual fibers coarse. There is a layer of circular fibers between the outer layer and the subcuticla, and another on the inner side of the inner layer. The medullary space is crossed by numerous strong dorso-ventral fibers.

Record of collection.

*Crocethia alba*:

1902, August 15.—Two scoleces and one strobile 24 mm. in length; rostellum without hooks; breadth at posterior end 3.25 mm. The bird was obtained by Dr. John D. Milligan of the Bureau of Fisheries steamer, *Fish Hawk*, near Cape Lookout, N. C.

•(U.S.N.M., Helm. Coll. 7892 (type).)

Genus FIMBRIARIA Frölich<sup>5</sup>

Examples of this genus have been collected by Mr. Edwards in the Woods Hole region from *Mergus serrator*, *Oidemia deglandi*, *O. perspicillata*, *Fulica americana*, and *Harlelda hyemalis*. There is great diversity of shape and form presented by the representatives of this genus in the collection, but, so far as I am able to determine, after a study of many whole mounts and series of sections, they are referable to two species only, namely, the widely distributed species *Fimbriaria fasciolaris* and the new species *F. falciiformis*.

## FIMBRIARIA FASCIOLARIS (Pallas)

Figures 194-199

*Scolex*.—Minute, at the extremity of a pennon-like pseudoscolex; rostellum with a circle of 10 hooks. The dimensions of the scolex agree with those given in the literature of the species. Thus, in one case, the breadth of the scolex was 0.10 mm.; breadth of sucker 0.036, length 0.045; diameter of circle of hooks 0.03; length of hooks 0.02.

The pseudoscolex is reflected until it is nearly or quite at right angles to the strobile. There is, moreover, a tendency to extend laterally, in a more or less rounded projection, at the base. This is best seen in young specimens. It is thus easy to distinguish this species from *F. falciiformis*, which latter, especially in young specimens, has a sickle-shaped pseudoscolex. The length of the pseudoscolex, to which the scolex, whose dimensions have been given above, was attached, was 6 mm.; its greatest breadth 1.5.

*Strobile*.—Unsegmented, although the closely crowded transverse wrinkles give the appearance of segmentation. Genitalia, except in a very rudimentary state, rather remote from the scolex; genital pores unilateral, and very closely crowded together. In a series of transverse sections not exceeding 0.015 mm. in thickness, portions of as many as three cirrus-pouches may be seen in a single section. The cirrus is short, and is armed with numerous, minute spines; length of larger, basal spines about 0.006 mm. The cirrus-pouch is nearly cylindrical, its length approximately four or five times the diameter, as for instance, length 0.15; breadth 0.030; its inner portion acts as a seminal vesicle. The vas deferens connects with an inner seminal vesicle. There appear to be three testes, one situated at a distance equal to about one-fourth the breadth of the strobile from each lateral margin, and one near the median line; vasa efferentia convey sperm from these to the inner seminal vesicle.

<sup>5</sup> For synonymy see Taenioid Cestodes of North American Birds, Ransom. Bull. 69, U. S. National Museum.

The vagina opens on the ventral side of the cirrus. It communicates with a relatively spacious seminal receptacle, which lies on the median side of the inner seminal vesicle. The lining of minute spines, noted in the exterior portion of the vagina of *F. falciformis*, was not observed in any of the sections of this species. The ovary is tubular, in some cases slightly branching, and lies on the ventral side of the medullary space, near the median line. The vitelline gland is slender and lies ventral to the ovary. As is shown in figure 196 its length may be more than three times that of the ovary as seen in transverse sections of the strobile. Figure 198 is from a camera lucida sketch of the complex of female genital ducts as it appeared in a series of sections of an unripe portion of a strobile, the uterus, only, being diagrammatic. In ripe portions of the strobile ova fill practically all of the medullary space. Here and there, however, in the series of sections, there are indications of an earlier tubular stage of development of the uterus, as is shown in the diagram. The ova, as they appear in these sections, have thin shells, and have a maximum diameter of 0.036 mm.

The thickness of the cuticle as about 0.003, of the subcuticula, about 0.17. The latter is granular, crossed with fine, radial fibers, and contains large numbers of calcareous bodies; some of these bodies are circular in outline, but most of them are oval, and range from 0.007 to 0.014 in the major diameters. Next within the subcuticula there is a layer of longitudinal muscle fibers consisting of a single circle of fascicles. These fascicles are irregularly oval in cross section, the longer diameter radial, and the cross sections approximately 0.052 by 0.024 in the two principal diameters. Within the layer of longitudinal muscles there is an inconspicuous layer of fine granules with a few circular fibers.

The water vascular system consists of three pairs of principal vessels, which are more or less sinuous; a pair situated at a distance equal to about one-fourth the breadth of the strobile from each lateral margin, and a third pair not far from the median line. These vessels, with the exception of the enlarged median one, are small and of nearly uniform size, about 0.015 in diameter. The walls of these vessels are relatively rather thick. The difference in size between the large vessel of the median pair and that of the other longitudinal excretory vessels is striking. Thus, in a transverse section through a portion of the strobile where the reproductive organs were mature, but no ova had yet appeared, the diameter of the more marginally placed vessels, and the smaller of the median pair, was about 0.015, while that of the median large vessel was 0.08 by 0.15 (fig. 196). In a section made through a portion of the strobile where the medullary space was filled with ova, and no trace of the smaller

vessels remained, the large vessel persisted, the two principal diameters being 0.13 by 0.09 (fig. 197).

The above description is based on material from *Mergus serrator*. The agreement is close with *F. fasciolaris*, as described by Wolffhügel in his monograph.<sup>6</sup> None of the preparations reveal any spines at the outlet of the vagina. Furthermore, the dimensions of the hooks at the base of the cirrus are smaller than those recorded for this species.

#### RECORD OF COLLECTIONS

##### *Mergus serrator*.

(U.S.N.M., Helm. Coll. 7893.)

1903, November 5.—Ten fragments of strobiles, three with pseudoscoleces; longest strobile with pseudoscolex 52 mm.; length of pseudoscolex 4.8; breadth back of pseudoscolex 0.78, at posterior end 1.6; maximum breadth observed 3.

1912, February 6.—One, length 50 mm.

1913, November 7.—Nineteen with pseudoscoleces, and a few fragments. Two of the longest measured 123 and 136 mm., respectively, in length; maximum breadth 3.

1914, February 20.—Three, and two fragments; lengths of strobiles 21, 38, and 130 mm., of fragments 15 and 18; maximum breadth 4.

1914, February 21.—One, length 22 mm.

1914, February 24.—Three, and a number of fragments, macerated.

##### *Oidemia deglandi*, new host:

1909, February 2.—Twelve strobiles with pseudoscoleces and many fragments, all very irregularly contracted. These strobiles are linear and subcylindrical for the greater part of the length, then enlarge abruptly near the posterior end, where the greatest breadth observed was 5 mm. The pseudoscoleces were much crumpled; the largest from 4.5 to 5 mm.; maximum length of strobile 55.

1913, August 14.—One hundred and forty-five, from 3 to 10 mm. in length; relatively short and broad; some of this lot are *F. falciformis*.

1913, September 4.—Ninety-two; some very small, 2 mm., or less, in length. The longest strobile with pseudoscolex was 30 mm. in length; one, from which the pseudoscolex was missing, was 34 mm. in length; maximum breadth 2.5.

1913, November 4.—Ten; some very small, 5 mm., or less; longest 40 mm.

<sup>6</sup> Arbeit aus dem Universität Basel, 1900.



1914, June 2.—Five hundred, more or less; 100 of these larger, up to 34 mm. in length, maximum breadth 3.5; the others small, 2 to 10 mm. in length.

1916, October 18.—Forty-one; from 3 to 25 mm. in length in one vial. In another vial, with label of same date, there were 191 from 1 to 22 mm. in length.

1916, October 28.—Nine, from 5 to 15 mm. in length.

FIMBRIARIA FALCIFORMIS, new species

Figures 200–213

*Scolex*.—Minute as compared with the pseudoscolex, diameter about 0.10 mm.; suckers subcircular, diameter about 0.04; rostellum moderately elongate, with a circle of 10 hooks about 0.015 mm. in length.

Pseudoscolex tapering and more or less sickle-shaped, without any sharp constriction at its base, thus appearing as a curved and flattened continuation of the strobile into which rudiments of the reproductive organs extend for some distance.

*Strobile*.—Linear with reproductive organs less crowded than in *F. fasciolaris*. Testes laterally elongated and much lobed, three in number, although in some of the anterior portions of the strobile there appear to be but two. Hooks on base of cirrus 0.006 mm. in length, and a little coarser in appearance than in *F. fasciolaris*. The cirrus-pouch in a series of sections of a strobile from *Clangula hyemalis* measured about 0.30 in length and 0.036 in diameter. The base of the cirrus-pouch acts as a seminal vesicle; there is also an inner seminal vesicle. The vagina, at its entrance into the genital pore, is lined with fine hooks; it lies on the ventral side of the cirrus-pouch and leads to a seminal receptacle. Ovary and vitelline gland slender, with about the same proportions and position as in *F. fasciolaris*. The tubular uterus persists, and even in sections of maturing proglottides was seen to lie in closely packed irregular coils in the medullary space (fig. 211). There is a single layer of longitudinal muscles, and there are four pairs of longitudinal excretory vessels, of which the ventral have relatively thin, and the dorsal thick walls. In a transverse section of an adult proglottis the largest ventral vessel had the following dimensions: Diameters 0.045 by 0.033, of lumen 0.039 by 0.027; largest dorsal vessel, diameters 0.024 by 0.018, of lumen 0.015 by 0.011.

RECORD OF COLLECTIONS

*Oidemias deglandi*:

1913, August 14.—One hundred and forty-five, from 3 to 10 mm. in length; maximum breadth 1.8; all immature. Some of this lot belong to the species *F. fasciolaris*.

1914, June 2.—Forty-five, from 10 to 30 mm. in length.  
(U.S.N.M., Helm. Coll. 7894 (type).)

See under *F. fasciolaris* for other dates. *F. falciiformis* was found in considerable numbers associated with *F. fasciolaris* in material from *O. deglandi* which had been placed in the same bottle before it was noted that more than one species was represented. A slide prepared at the time of collecting on August 14, 1913, makes it clear that *F. falciiformis* was present in the scoter which was examined on that date.

*Oidemia perspicillata*:

1914, February 18.—Three; 115, 120, and 130 mm. in length, respectively, with nearly uniform breadth of 2 mm.

*Clangula hyemalis*:

1914, February 16.—Eight; smallest, length 9 mm., maximum breadth 1 mm. My notes made while making a preliminary examination of formalin material record a specimen from this lot measuring 34 mm. in length and 4 mm. in maximum breadth, but the greatest length noted in the alcoholic material is 15, with a maximum breadth of 3. These forms from *C. hyemalis* are more corrugated than those from *Oidemia*, but the reproductive organs are of the same type as in the forms referred to *F. falciiformis*.

*Fulica americana*:

1920, November 3.—Two strobiles, collected by Robert A. Goffin. The larger specimen in balsam measures 8 mm., exclusive of pseudoscolex; greatest breadth 1.4; length of pseudoscolex 4.2. The strobile tapers to a blunt point at the posterior end. There are about five sets of reproductive organs to the millimeter at the posterior end and about six to the millimeter in the median region; reproductive organs at the posterior end mature, but ova not yet developed.

EXPLANATION OF PLATES

c. cirrus.	sg. shell gland.
cm. circular muscle.	sr. seminal receptacle.
cp. cirrus-pouch.	sv. seminal vesicle.
de. dorsal excretory vessel.	t. testis.
ex. excretory vessel.	te. transverse excretory vessel.
gc. genital cloaca.	u. uterus.
im. inner longitudinal muscle.	v. vagina.
lm. longitudinal muscle.	vd. vas deferens.
n. nerve.	ve. ventral excretory vessel.
o. ovary.	vg. vitelline gland.
om. outer longitudinal muscle.	y. yolk reservoir.
ot. ootype.	yd. vitelline duct.
sd. sperm duct.	

## PLATE 1

*Ligula intestinalis* (Linnaeus) from *Podilymbus podiceps*

- FIG. 1. Anterior end of strobile, sharp-pointed type; breadth at x-x 0.4 mm.  
2. Anterior end of strobile, bluntly rounded type; breadth at x-x 1 mm.  
3. Transverse section, about 0.1 mm, from anterior end; longest diameter of section 1.36 mm.  
4. Transverse section showing genitalia; camera lucida drawing, details added from adjoining sections; dorso-ventral diameter 0.7 mm.

*Schistocephalus solidus* (C. F. Müller), from *Podilymbus podiceps*

5. Anterior end of strobile; breadth at base of first segment 1 mm.

*Tetrabothrius cylindraceus* (Rudolphi)

6. Scolex; maximum breadth 0.35 mm., from *Larus argentatus*.  
7. Adult proglottis, ventral view; breadth 0.93 mm.; from *Sterna hirundo*.  
8. Dorsal view of same.  
9. Frontal section of adult proglottis; breadth 0.98 mm.  
10. Transverse section in vicinity of genital pore; diameter of cirrus-pouch 0.04 mm.

## PLATE 2

*Tetrabothrius cylindraceus* (continued).

- FIG. 11. Diagram of female genitalia.  
12. Maturing proglottides; breadth 1.56 mm.  
13. Mature proglottis; breadth 1.82 mm.

*Tetrabothrius heteroclitus* (Diesing).

14. Scolex; breadth 0.45 mm., from *Puffinus borealis*.  
15. Transverse section of scolex; greater diameter 0.46 mm.  
16. Transverse section of proglottis; longer diameter 0.44 mm.  
17. Details of body wall of same; camera lucida drawing, Zeiss 2/D.  
18. Transverse section of genital cloaca; diameter of cirrus-pouch 0.041 mm.; from *Nycticorax nycticorax naevius*.  
19. Ripe proglottides, posterior to proglottis shown in figure 20; breadth 0.34 mm.; from *Puffinus griseus*.  
20. Adult proglottis; maximum breadth 0.27 mm.

## PLATE 3

*Tetrabothrius heteroclitus* (continued)

- FIG. 21. Frontal section of ripe proglottides; breadth 1.33 mm.  
22. Genital cloaca and cirrus-pouch from frontal section of adult proglottis; diameter of cirrus-pouch 0.045 mm.

*Tetrabothrius macrocephalus* (Rudolphi)

23. Scolex; greatest breadth 0.73 mm., from *Colymbus auritus*.  
24. Transverse section of scolex; longer diameter 0.81 mm.  
25. Transverse section of immature proglottis; longer diameter 0.98 mm.  
26. Transverse section of adult proglottis; longer diameter 0.79 mm.  
(Pencil sketch of this figure misinterpreted; lateral diameter of vitelline gland too great.)

27. Mature proglottides; length 0.70 mm., from *Gavia immer*.
28. Mature proglottis; breadth 2.38 mm.
29. Transverse section through genital cloaca; dorso-ventral diameter 0.53 mm.
30. Transverse section of strobile near scolex; circular muscle layer to cuticle inclusive, 0.16 mm.
31. Longitudinal section of lateral margin of strobile showing varying position of outer longitudinal muscle layer with reference to the cuticle; length of proglottides about 0.45 mm.

## PLATE 4

*Tetrabothrius sulcatus*, new species from *Fregata magnificens*

- FIG. 32. Scolex and portion of strobile; diameter of scolex 0.48 mm.
33. Proglottides; breadth 0.40 mm.
  34. Proglottides from posterior end of strobile; breadth 0.53 mm.
  35. Adult proglottis; length 0.21 mm.
  36. Sagittal section of proglottides near poral margin; dorso-ventral diameter 0.43 mm.
  37. Transverse section of ripe proglottis; longer diameter 0.46 mm.
  38. Transverse section of proglottis in vicinity of genital pore; diameter of cirrus-pouch 0.048 mm.
  39. Frontal section through genital pore; diameter of cirrus-pouch 0.065 mm.

*Ophryocotyle protcus* (Fries), from *Larus atricilla*

40. Strobile; length 3 mm.
41. Scolex; breadth 0.28 mm.
42. Spines from rostellum; length 0.004 mm.
43. Spines from sucker; length 0.008 mm.
44. Proglottis; length 0.28 mm.

*Dilepis unilateralis* (Rudolphi) from *Butorides virescens*

45. Scolex; breadth 0.135 mm.
46. Rostellum; diameter, exclusive of hooks, 0.051 mm.
47. Immature proglottis; breadth 0.35 mm.
48. Adult proglottis; breadth 0.50 mm.

## PLATE 5

*Dilepis unilateralis* (continued)

- FIG. 49. Ripe proglottis; breadth 0.53 mm.
50. Transverse section of proglottis; 0.34 by 0.18 mm.
  51. Dorsal view of genital pore, from whole mount; camera lucida drawing, Spencer 6/4 mm.

*Choanotaenia parina* (Dujardin) from *Passer domesticus*

52. Rostellum; diameter 0.04 mm.
53. Proglottis; length 0.77 mm.

*Choanotaenia ransomi*, new species

- 54. Scolex; diameter 0.39 mm., from *Larus atricilla*.
- 55. Optical section of retracted rostellum; length of hooks 0.39 mm.
- 56. Single hook; length 0.039 mm.
- 57. Adult proglottis; breadth 0.08 mm.
- 58. Scolex and portion of strobile; breadth of scolex 0.36., from *Gavia immer*.
- 59. Tip of rostellum; diameter, exclusive of hooks, 0.07 mm.
- 60. Scolex and portion of strobile; diameter of scolex 0.39 mm., from *Larus philadelphia*.
- 61. Proglottides; breadth 0.28 mm.

## PLATE 6

*Choanotaenia ransomi* (continued)

- FIG. 62. Proglottides; maximum breadth 0.28 mm., from *Gavia immer*.
- 63. Diagram of female genitalia; from series of sections of material from *Larus marinus*.
- 64. Transverse section of strobile; greater diameter 0.42 mm.; a, posterior edge of segment which separates from the inner core in the following section of the series. From *Larus argentatus*.
- 65. Sagittal section of ripe proglottis; dorso-ventral diameter 0.28 mm.
- 66. Ovum, sketched from formalin material; diameter 0.072 mm.
- 67. Proglottides, from strobile 2 mm. in front of moniliform segments shown in the next figure; breadth 0.74 mm. (see text); from *Larus philadelphia*.
- 68. Ripe proglottis; length 1 mm.

*Choanotaenia*, species, from *Larus argentatus*

- 69. Scolex and anterior part of strobile; diameter of scolex 0.40 mm.
- 70. Hooks; length 0.105 mm.

*Hymenolepis anceps*, new species from *Mergus serrator*

- 71. Scolex; diameter 0.15 mm.
- 72. Hooks from rostellum; length 0.012 mm.
- 73. Proglottides, about 1 mm. from scolex; type of strobile with serrate lateral margins, breadth 0.18 mm.
- 74. Proglottides about 1 mm., from scolex; type of strobile with closely crowded segments; breadth 0.26 mm.
- 75. Adult proglottis; breadth 1.77 mm.
- 76. Ripe proglottis; breadth 2.60 mm.
- 77. Transverse section of ripe proglottis; diameters 2.66 by 0.70 mm.
- 78. Abnormal proglottides; breadth 2.50 mm.

## PLATE 7

*Hymenolepis ardeae* (Fuhrmann) from *Butorides virescens*

- FIG. 79. Scolex and portion of strobile; diameter of sucker 0.084 mm.
- 80. Hooks from rostellum; length 0.035 mm.
- 81. Immature proglottides; breadth 0.86 mm.

82. Transverse section of proglottis; genitalia supplied from about five sections; diameters 1.26 by 0.77 mm.
83. Transverse section of ripe proglottis; diameters 1.05 by 0.28 mm.
84. Frontal section of ripe proglottis; breadth 1.09 mm.
- 85, 86, 87. Transverse sections of cirrus and cirrus-pouch, from sagittal sections of proglottis; diameters of cirrus, 0.056, 0.07, and 0.09 mm.
88. Longitudinal section of cirrus and cirrus-pouch, from frontal section of proglottis; diameter of cirrus-pouch 0.11 mm.

*Hymenolepis coronula* (Dujardin)

89. Scolex; diameter of sucker 0.06 mm.; from *Oidemia perspicillata*.
90. Front view of scolex; diameter of sucker 0.07 mm.
91. Transverse section of proglottis; longer diameter 1.61 mm.
92. Adult proglottis; length 0.50 mm.; from *Glaucionetta clangula americana*.

PLATE 8

*Hymenolepis coronula* (continued)

- FIG. 93. Transverse section of genital cloaca; camera lucida drawing, Spencer 6/4 mm.

*Hymenolepis ductilis*, new species, from *Larus argentatus*

94. Scolex and portion of strobile; diameter of scolex 0.26 mm.
95. Tip of rostellum; length of hooks 0.039 mm.
96. Ventral view of young proglottis; breadth 0.33 mm.
97. Ventral view of proglottides; breadth 0.35 mm.
98. Dorsal view of young proglottis; breadth 0.30 mm.
99. Lateral margin of proglottides; length of proglottis 0.05 mm.
100. Ripe proglottides; breadth 0.35 mm.
101. Transverse section of ripe proglottis; diameters 0.39 by 0.15 mm.

*Hymenolepis fusus* (Krabb) from *Larus argentatus*

102. Scolex; diameter 0.10 mm.
103. Hooks from rostellum; length 0.02 mm.
104. Posterior end of strobile; maximum breadth 0.28 mm.

*Hymenolepis macracanthos* (Linstow) from *Mergus serrator*

105. Scolex; diameter 0.13 mm.
106. Hook from rostellum; length 0.09 mm.
107. Dorsal view of young proglottis; rudiment of ovary showing through from ventral side; breadth 0.50 mm.
108. Dorsal view of older proglottis, testes not seen; breadth 0.47 mm.
109. Ripe proglottis, with remnant of ovary; breadth 0.48 mm.
110. Ripe proglottis; breadth 0.53 mm.
111. Cirrus; diameter of bulbous base 0.036 mm.
112. Section of base of cirrus; diameter 0.030 mm.

## PLATE 9

*Hymenolepis macracanthos* (continued)

FIG. 113. Section of cirrus-pouch and vagina, from transverse section of proglottis; camera lucida drawing, Spencer 6/4 mm. s. sphincter muscle of vagina.

*Hymenolepis hamulacanthos*, new species, from *Marila americana*

- 114. Scolex; diameter 0.26 mm.
- 115. Rostellum, hooks retracted; length of hook 0.108 mm.
- 116. Single hook; length 0.108 mm.
- 117. Mature proglottis, somewhat diagrammatic; from whole mount, but part of vas deferens, vasa efferentia, and vitelline gland supplied from sections; breadth 1.47 mm.
- 118. Ripe proglottis, about 20 mm. from posterior end of strobile; breadth 1.47 mm.
- 119. Ripe proglottis, near posterior end of strobile; breadth 2.80 mm.
- 120. Nearly transverse section of proglottis; longer diameter 1.62 mm.
- 121. Cirrus; camera lucida drawing, Spencer 6/4 mm.
- 122. Transverse section of cirrus and vagina, 0.05 mm. from lateral margin of proglottis; diameter of cirrus 0.016 mm.
- 123. Same, 0.09 mm. from lateral margin of proglottis; same magnification as Fig. 122.
- 124. Same, 0.21 mm. from lateral margin of proglottis; diameter of cirrus-pouch 0.09 mm.
- 125. Transverse section of cirrus-pouch and vagina, 0.30 mm. from the lateral margin of the proglottis; diameter of cirrus-pouch 0.09 mm.
- 126. Transverse section of longitudinal muscles; Spencer 10/4 mm.

## PLATE 10

*Hymenolepis pachycephala* (Linstow)

- FIGS. 127, 128, 129. Scoleces and portions of strobiles; diameters of scoleces 0.24, 0.22, and 0.24 mm.
- 130. Hooks from rostellum; length 0.045 mm.

*Hymenolepis podicipina* (Szymanski) from *Colymbus auritus*

- 131. Scolex; diameter 0.17 mm.
- 132. Front view of scolex; diameter 0.17 mm.
- 133. Front view of rostellum; diameter 0.07 mm.
- 134. Hooks; length 0.03 mm.
- 135. Immature proglottides; breadth 0.22 mm.
- 136. Posterior end of strobile; maximum breadth 0.28 mm.
- 137. Cirrus; length of proglottis 0.045 mm.
- 138. Transverse section of proglottis; longer diameter 0.50 mm.

*Hymenolepis rostellata* (Abilgaard) from *Gavia immer*

- 139. Scolex; diameter 0.34 mm.
- 140. Tip of rostellum; diameter, exclusive of hooks, 0.093 mm.
- 141. Adult proglottis; breadth 0.68 mm.
- 142. Genital cloaca and base of cirrus, from transverse section of proglottis; diameter of genital cloaca 0.066 mm.

*Hymenolepis tritesticulata* (Fuhrmann)

- 143. Scolex; diameter 0.18 mm., from *Fulica americana*.
- 144. Hook from rostellum; length 0.039 mm.
- 145. Ripe proglottides; breadth 0.50 mm.
- 146. Proglottides, ventral view; breadth 0.27 mm., from *Marila marila*.
- 147. Cirrus and cirrus-pouch; length of cirrus 0.135 mm.

*Hymenolepis*, species (Genus *Weinlandia*, Mayhew, 1925)

- 148. Scolex; diameter 0.19 mm., from *Marila marila*.
- 149. Hooks from rostellum; length 0.015 mm.
- 150. Rostellum; diameter at circle of hooks 0.054 mm., from *Oidemia deglandi*.
- 151. Hook from rostellum; length 0.010 mm.

## PLATE 11

*Hymenolepis*, species (continued)

FIG. 152. Adult proglottis; breadth 1.22 mm.

*Hymenolepis*, species from *Larus delawarensis*

- 153. Scolex; diameter 0.14 mm.
- 154. Hooks from rostellum; length 0.054 mm.
- 155. Immature proglottides; breadth 0.22 mm.
- 156. Immature proglottides; breadth 0.28 mm.

*Hymenolepis*, species from *Fulica americana*

- 157. Scolex; diameter 0.19 mm.
- 158. Hook from rostellum; length 0.036 mm.
- 159. Cirrus and cirrus-pouch; diameter of cirrus-pouch 0.036 mm.

*Rhabdometra similis* (Ransom), from *Coccyzus americanus*

- 160. Scolex and portion of strobile; breadth of scolex 0.25, of neck 0.22 mm.
- 161. Scolex and portion of strobile, slender type; breadth of scolex 0.22, of neck 0.13 mm.
- 162. Ripe proglottis; length 0.98 mm.; *p*, parauterine organ.
- 163. Cirrus and cirrus-pouch, from transverse section of ripe proglottis; diameter of cirrus-pouch 0.05 mm.

*Diorchis acuminata* Clerc from *Marila americana*

- 164. Scolex; diameter 0.24 mm.
- 165. Hook from rostellum; length 0.048 mm.
- 166. Immature proglottides; breadth 0.40 mm.
- 167. Cirrus; length from base of tumid portion 0.10 mm.
- 168. Adult proglottis; breadth 0.63 mm.
- 169. Ripe proglottis, ova not yet mature; breadth 1.05 mm.
- 170. Ripe proglottis, ova mature; breadth 0.60 mm.
- 171. Ovum; 0.075 by 0.015 mm.



## PLATE 12

*Diorchis acuminata* (continued)

FIG. 172. Ventral view of genitalia, whole mount; camera lucida drawing, Spencer 6/4 mm.

173. Transverse section, adult proglottis; 0.74 by 0.45 mm.

*Valipora mutabilis*, new species from *Nycticorax nycticorax nuevius*

174. Scolex; diameter 0.20 mm.

175. Hooks from rostellum; length 0.030 mm.

176. Immature proglottides; breadth 0.48 mm.

177. Adult proglottis, breadth 0.39 mm.

178. Adult proglottis, dorsal view; breadth 0.43 mm.

(Figs. 176-178, somewhat diagrammatic. The testes were not clearly defined in the whole mounts.)

179. Ripe proglottis; breadth 0.46 mm.

180. Ripe proglottis, immediately preceding the segment sketched in Fig. 181; breadth 0.49 mm.

181. Posterior proglottis; breadth 0.49 mm.

*Valipora parvispine*, new species, from *Gavia immer*

182. Scolex; diameter 0.56 mm.

183. Rostellum, retracted; diameter circle of hooks 0.03, length of hooks about 0.010 mm.

184. Immature proglottides; breadth 0.30 mm.

185. Adult proglottis, partly diagrammatic; breadth 0.63 mm.

186. Transverse section of proglottis; longer diameter 0.56 mm.

187. Transverse section of longitudinal muscles; smaller fascicles on cuticular side; camera lucida sketch, Spencer, 6/4 mm.

## PLATE 13

*Gyrocoelia milligani*, new species from *Orocethia alba*

FIG. 188. Scolex and portion of strobile; diameter of scolex 0.22 mm.

189. Scolex; diameter 0.22 mm.

190. Proglottides; breadth 1.40 mm.

191. Section of basal portion of cirrus-pouch; 0.21 by 0.17 mm.

192. Section of cirrus-pouch with retracted cirrus; 0.19 by 0.15 mm.

193. Spines from cirrus; length 0.015 mm.

*Fimbriaria fasciolaris* (Pallas) from *Mergus serrator*

194. Pseudoscolex and scolex; length of pseudoscolex 4.6 mm.

195. Scolex; diameter 0.10 mm.

196. Transverse section of proglottis; longer diameter 1.42 mm.  
a. Calcareous bodies.

197. Transverse section of ripe proglottis; longer diameter about 3 mm.

198. Diagram of genitalia.

199. Cirrus; length of spines about 0.006 mm.

*Fimbriaria falciformis*, new species

- 200, 201, 202. Immature strobiles from *Oidemia deglandi*; lengths 4.2, 5.6, and 4.5 mm.  
 203. Scolex; enlarged view of scolex shown in Fig. 204, from *Clangula hyemalis*; diameter 0.12 mm.

## PLATE 14

*Fimbriaria falciformis* (continued)

- FIG. 204. Immature strobile from *Clangula hyemalis*; length, excluding pseudo-scolex, 8 mm.  
 205. Transverse section of adult proglottis; longer diameter 1.32 mm.  
 206. Transverse section, diagrammatic; made up from about 5 sections; diameters 1.28 by 0.28 mm.  
 207. Section of cirrus and vagina, from transverse section of proglottis; diameter of cirrus at base 0.03 mm.  
 208. Transverse section of proglottis; from *Oidemia perspicillata*; longest diameter 1.26 mm.  
 209. Transverse section of proglottis; longer diameter 1.22 mm.  
 210. Dorsal view of proglottides, whole mount; breadth 1.20 mm.  
 211. Transverse section of ripe proglottis; longer diameter 1.05 mm.  
 212. Section of cirrus-bulb and vagina, from transverse section of proglottis; length of cirrus-pouch 0.17 mm.  
 213. Ova in uterus; camera lucida drawing, Zeiss 2/D.

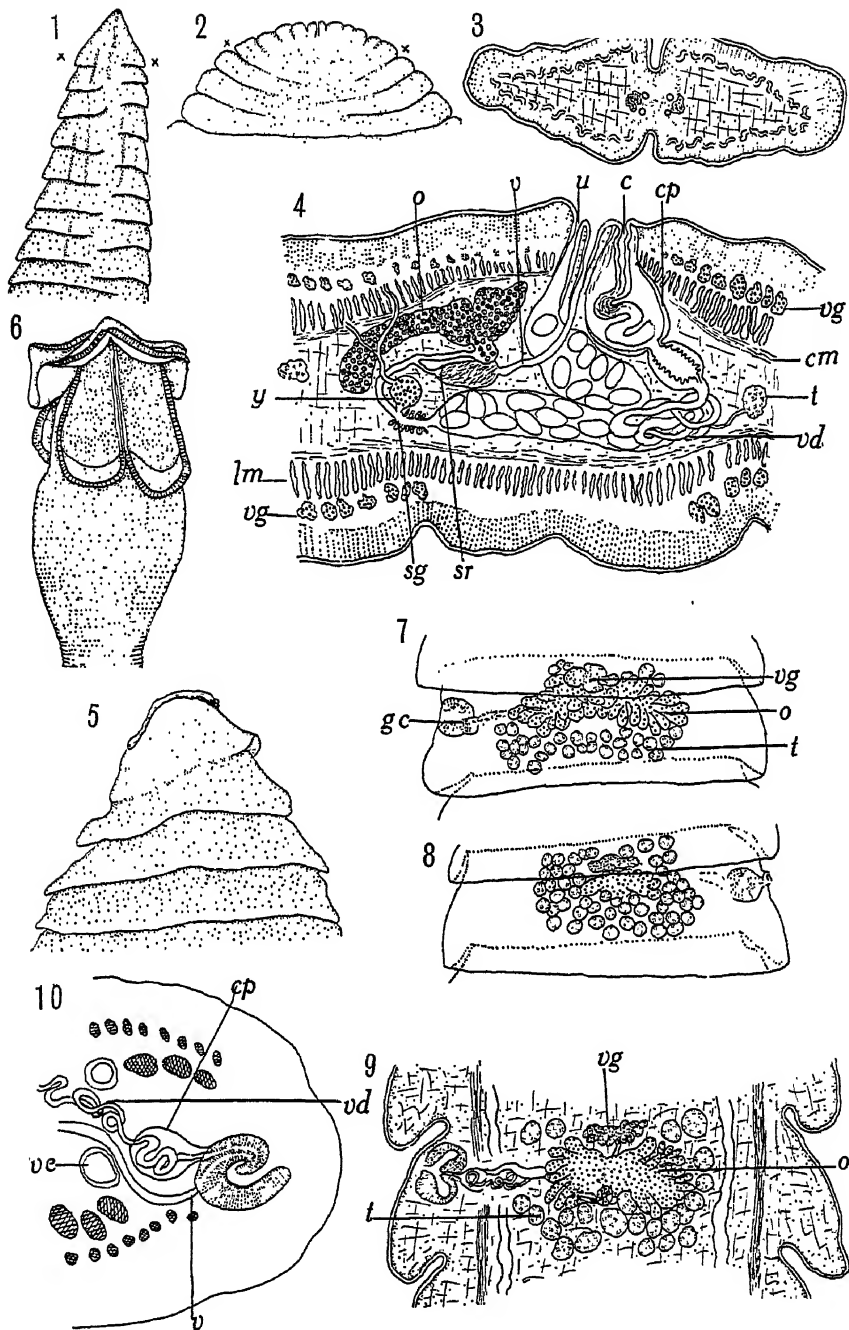
## PLATE 15

*Diploposthe lacvis* (Bloch, 1782), Jacobi, 1896, from *Merula americana*

- FIG. 214. Adult proglottides; breadth 1.68 mm.  
 215. Ripe proglottides; breadth 2.78 mm.  
 216. Adult proglottis; length 1 mm.  
 217. Adult proglottis, posterior to the one shown in fig. 216; breadth 1.68 mm.  
 218. Ripe proglottis; breadth 3.92 mm.  
 219. Transverse section of ripe proglottis; greater diameter 2.68 mm.  
 220. Cirrus, optical section, from whole mount; diameter of cirrus 0.066 mm.  
 221. Spines on cirrus; length 0.004 mm.

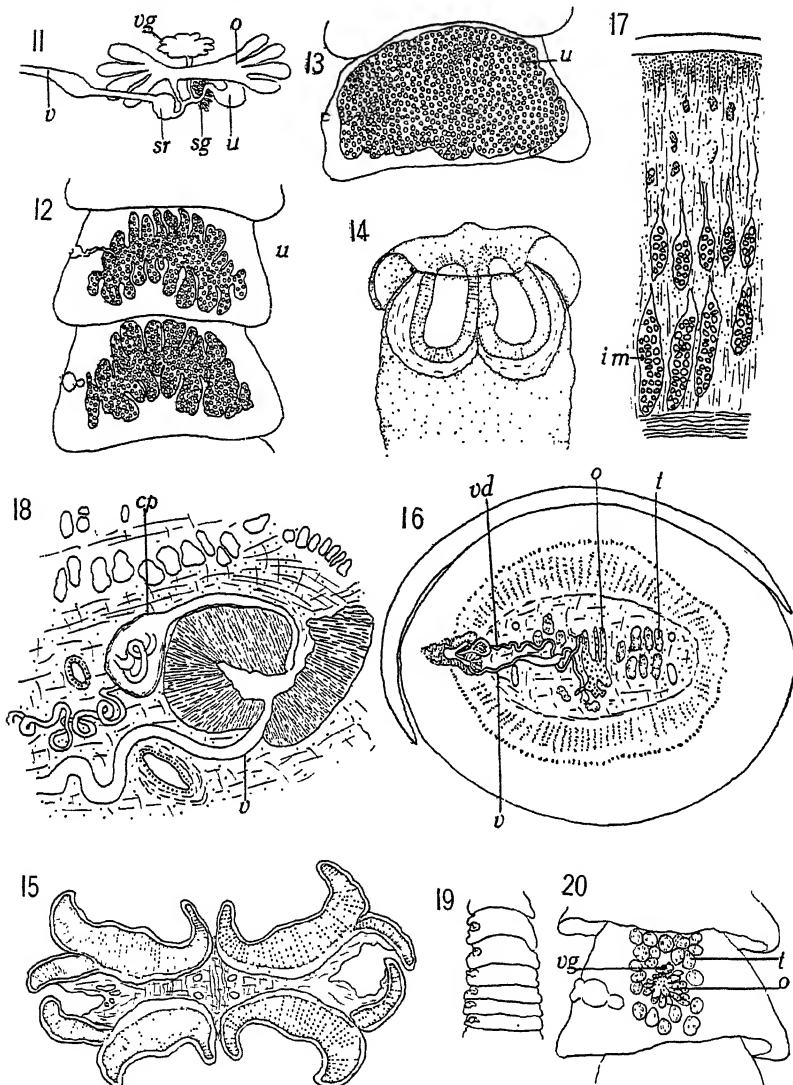






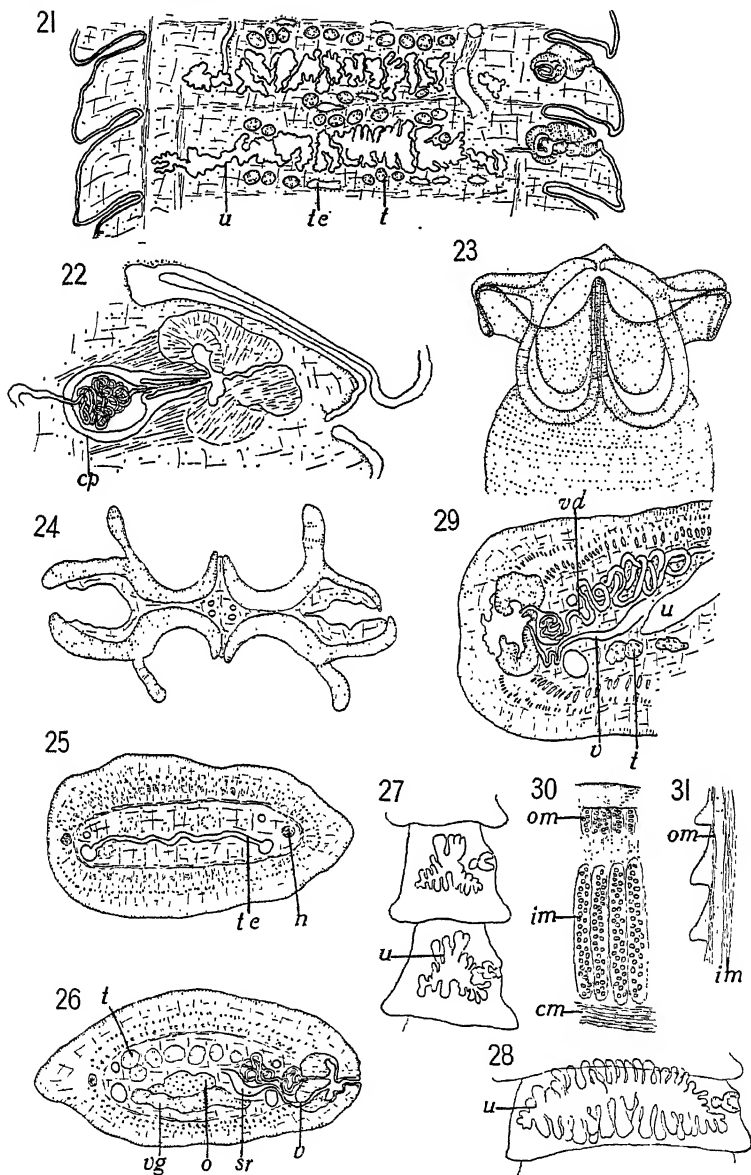
CESTODES OF GREBE, GULL, AND TERN

FOR EXPLANATION OF PLATE SEE PAGE 66



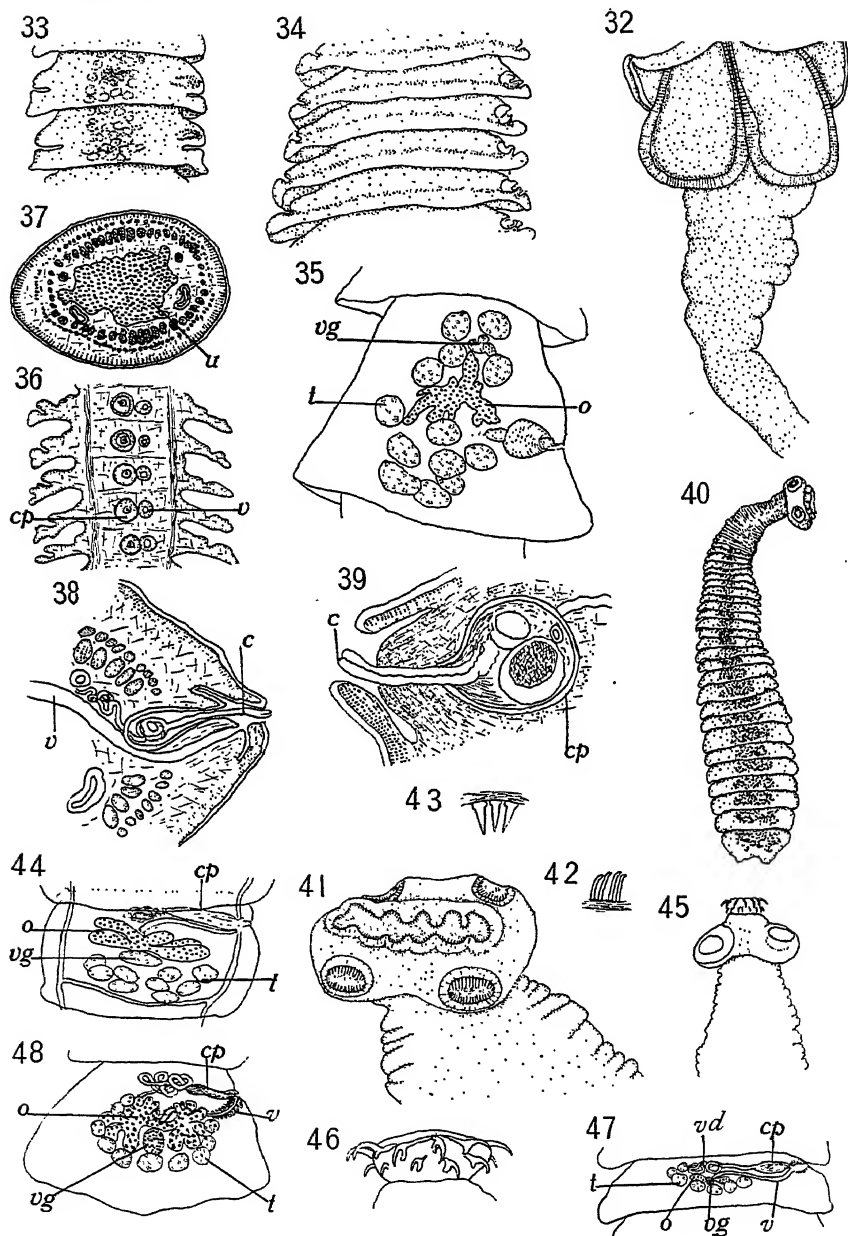
CESTODES OF SHEARWATERS AND NIGHT HERON

FOR EXPLANATION OF PLATE SEE PAGE 66



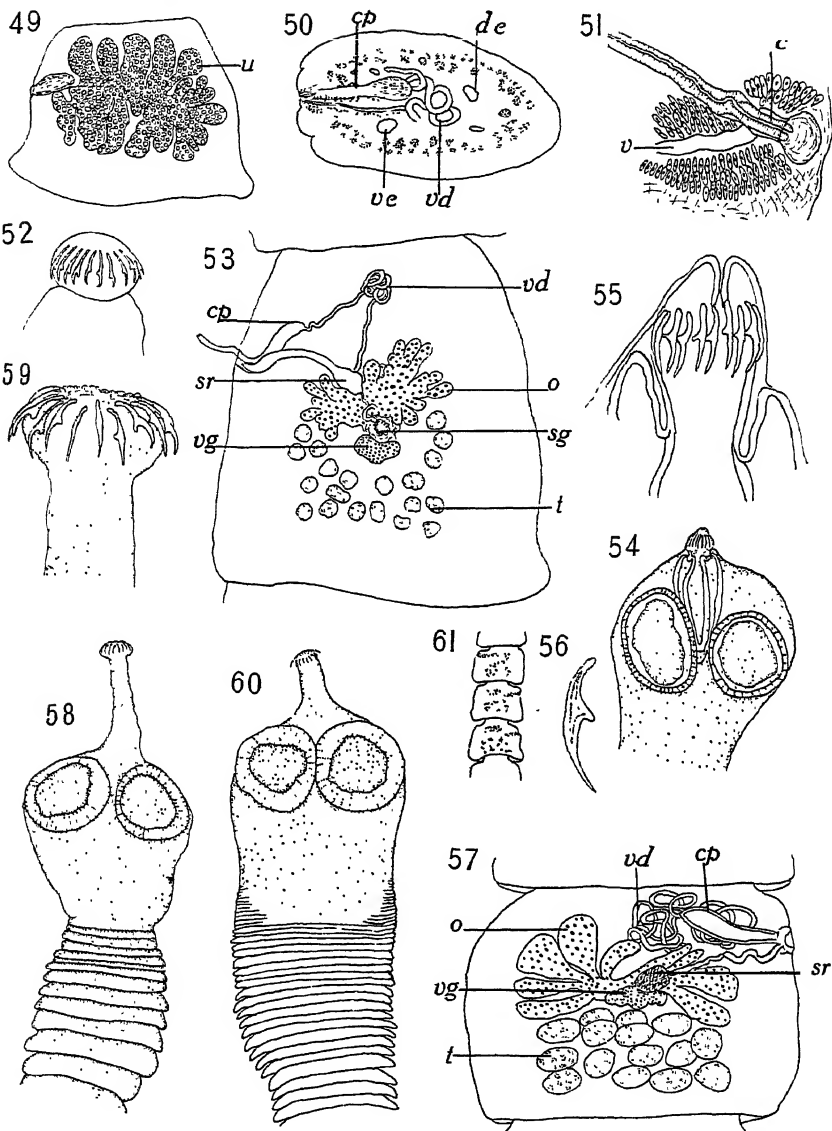
## CESTODES OF SHEARWATER, GREBE, AND LOON

FOR EXPLANATION OF PLATE SEE PAGES 66 AND 67



CESTODES OF FRIGATE-BIRD, GULL, AND GREEN HERON

FOR EXPLANATION OF PLATE SEE PAGE 67

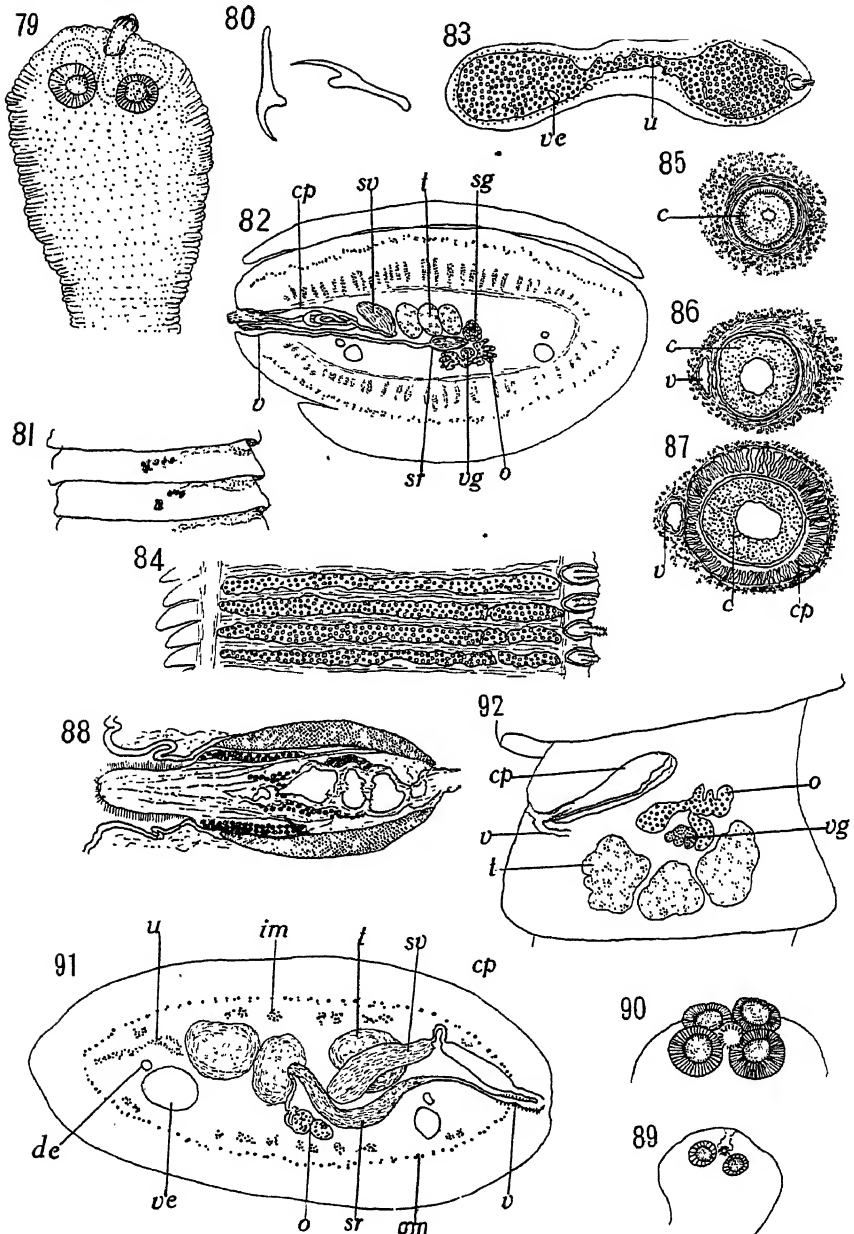


CESTODES OF GREEN HERON, ENGLISH SPARROW, GULLS, AND LOON

FOR EXPLANATION OF PLATE SEE PAGES 67 AND 68







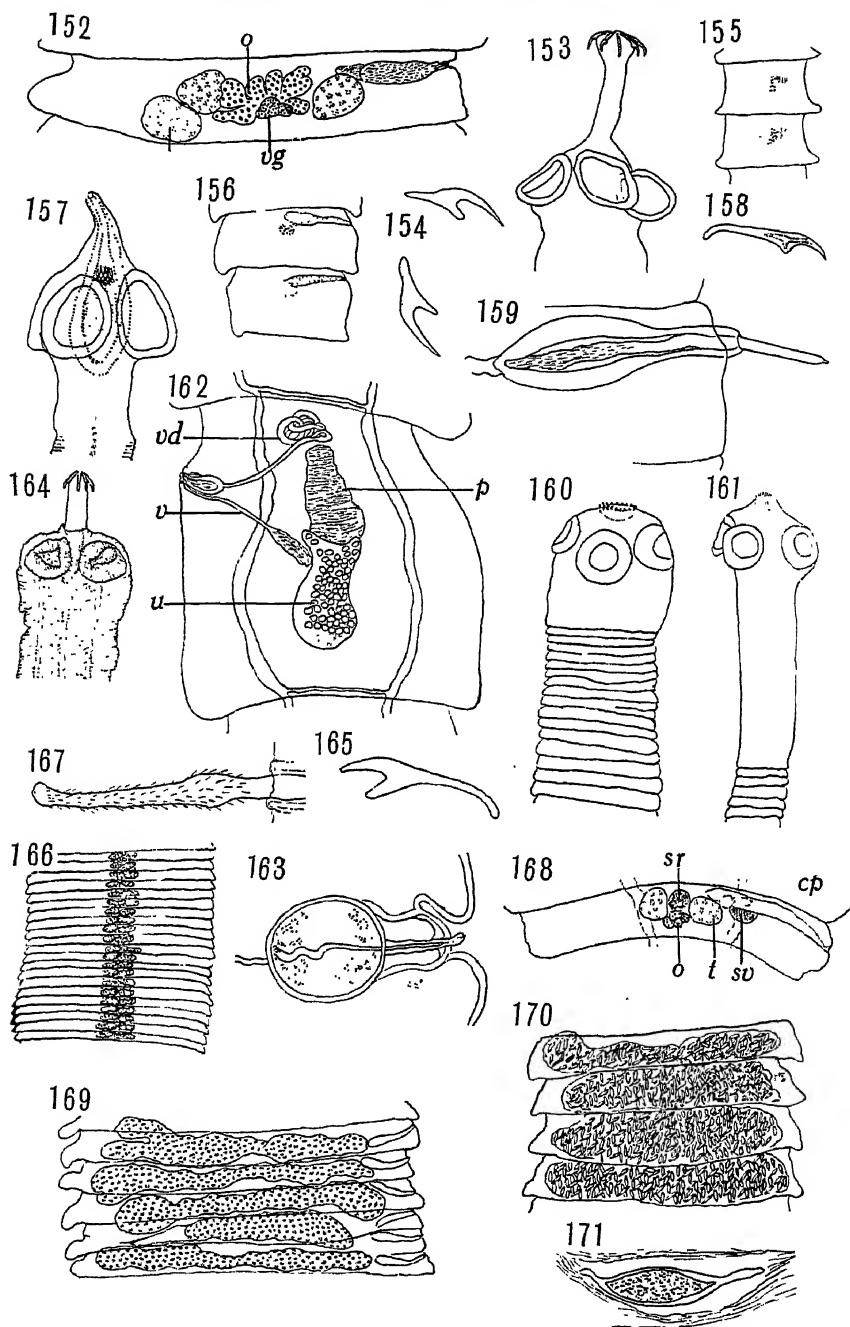
CESTODES OF GREEN HERON, SCOTER, AND WHISTLER DUCK

FOR EXPLANATION OF PLATE SEE PAGES 68 AND 69



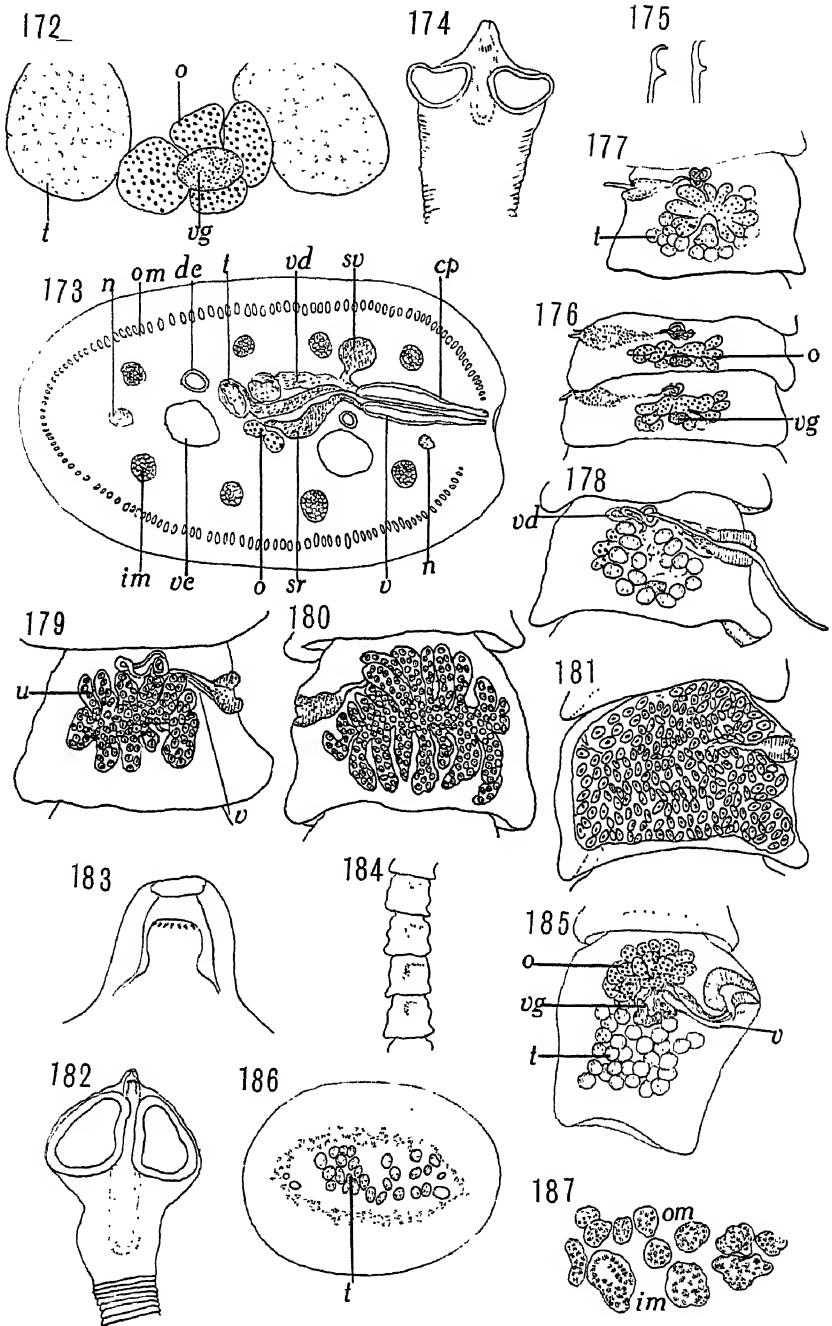






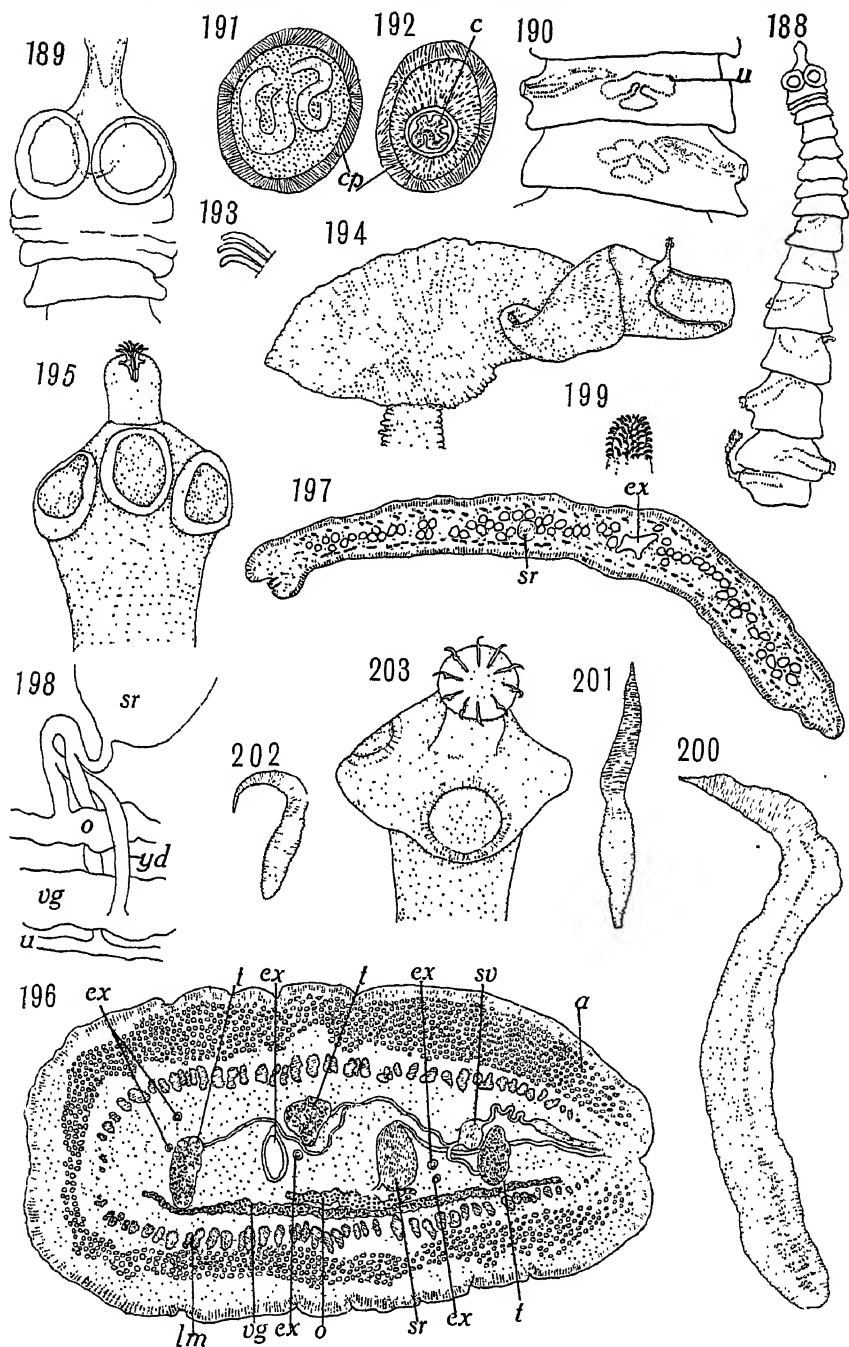
CESTODES OF SCOTER, GULL, COOT, YELLOW-BILLED CUCKOO, AND AMERICAN POCHARD

FOR EXPLANATION OF PLATE SEE PAGE 71



CESTODES OF AMERICAN POCHARD, NIGHT HERON, AND LOON

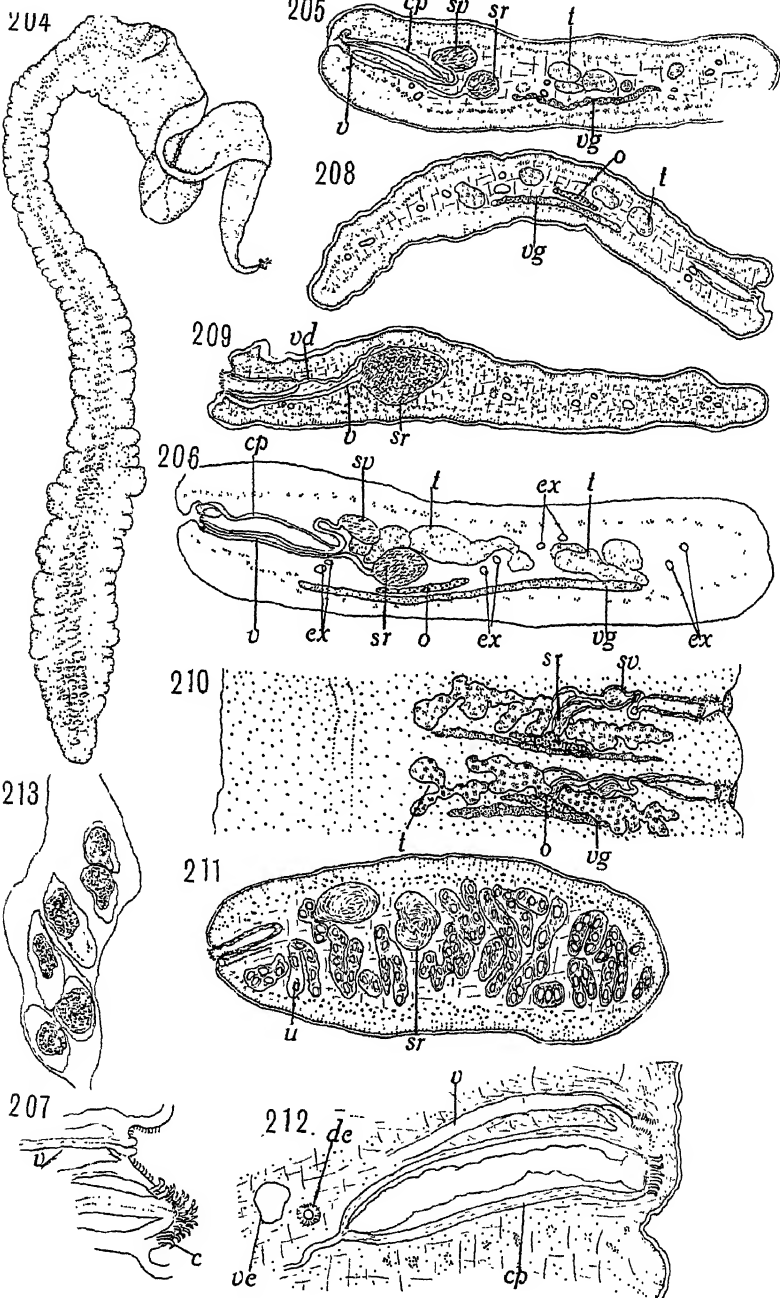
FOR EXPLANATION OF PLATE SEE PAGE 72



CESTODES OF SANDERLING, SHELDRAKE, SCOTER, AND OLD SQUAW

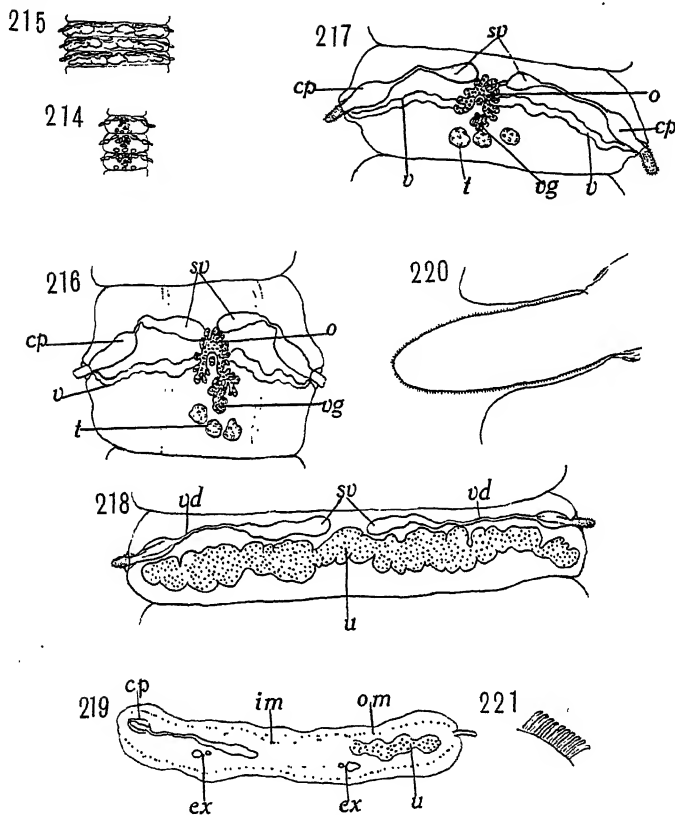
FOR EXPLANATION OF PLATE SEE PAGES 72 AND 73





CESTODES OF OLD SQUAW AND SCOTER

FOR EXPLANATION OF PLATE SEE PAGE 73



CESTODES OF AMERICAN POCHARD

FOR EXPLANATION OF PLATE SEE PAGE 73



# SOME BRACONID AND CHALCID FLIES FROM FORMOSA PARASITIC ON APHIDS

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*Of the Bureau of Entomology, United States Department of Agriculture*

The material upon which the following notes and descriptions are based was sent to the United States Department of Agriculture for identification by T. Shiraki, of Taihoku, Formosa. Very little information occurs in the literature concerning the parasites of plant lice from this region, and it is, therefore, a pleasure to be able to make this small contribution toward such knowledge. The following records are especially valuable because in every instance the material was reared and is accompanied by a definite host record.

## Superfamily ICHNEUMONOIDEA

### Family BRACONIDAE

#### Subfamily APHIDIINAE

##### APHIDIUS ERVI Haliday

Four specimens which appear to be this species were reared from *Macrosiphum*, species on *Rubus* at Taihoku, Formosa, by R. Takahashi, December 2, 1923.

##### APHIDIUS UNILACHNI, new species

Differs from all other species known to the writer by the very slender and slightly upturned ovipositor sheaths.

*Female*.—Length 2.2 mm. Smooth and shining, the first tergite very weakly rugulose. Head transverse, a little broader than the thorax, distinctly narrowed behind the eyes; eyes very slightly converging anteriorly; distance from antennae to apex of clypeus nearly equal to shortest distance between the eyes; palpi short; antennae 16-jointed, the third joint approximately twice as long as thick and the following joints, except the last, of about the same length as the third, last joint nearly twice as long as the third;

notauli absent except at anterior angles of mesonotum; propodeum smooth, sharply declivous behind, the dorsal portion with a very delicate median longitudinal carina, the posterior face with a very broad median area and on each side at the posterior lateral angles a much smaller area; wings normal for the genus, the first abscissa of radius a little less than twice as long as the second abscissa, which is slightly longer than the intercubitus, discocubital vein complete; brachial cell complete; abdomen one and one-half times as long as the head and thorax, slender, tapering toward apex; first tergite slightly broader at apex than at base; ovipositor sheaths very slender, tapering to a point at apex, and distinctly curved upward. Head and thorax brownish black; mandibles, palpi, sides of pronotum, legs including coxae, first tergite, basal half of second tergite, more or less of third tergite and the apex of abdomen brownish yellow; antennae uniformly blackish; abdomen, except as indicated, fuscous; wings hyaline, the veins and stigma pale yellowish.

*Male*.—Length 1.8 mm. Antennae 19-jointed, the flagellar joints all subequal and about twice as long as thick, the apical one very slightly longer than the preceding one; second abscissa of radius subequal to the transverse cubitus and half as long as first abscissa. Head, thorax, abdomen, and antennae nearly uniformly brownish black, the first tergite at base somewhat paler; legs dark brownish testaceous. Other characters as in the female.

*Type locality*.—Taihoku, Formosa.

*Type*.—Cat. No. 28983, U.S.N.M.

*Host*.—*Unilachnus*, species.

Two females and one male received from T. Shiraki and said to have been reared from the above aphid on *Pinus* by R. Takahashi, October 22, 1923.

#### APHIDIUS, species

Five specimens of a species of *Aphidius* reared from *Macrosiphum neoartemisiae* Takahashi in March, 1923, at Taihoku, Formosa, by R. Takahashi, are in too poor condition for positive determination. This is a small, brownish testaceous species superficially resembling *Lysiphlebus japonicus* Ashmead but distinguishable by the complete discobital nervure and the more completely areolated propodeum.

#### APHIDIUS LATICEPS, new species

Resembles *A. pinaphidis* Ashmead, but the mesoscutum is less strongly sculptured, the wing stigma is more triangular, and the ovipositor sheaths are broader and shorter.

*Female*.—Length 3.8 mm. Head smooth, viewed from above broader than the thorax, fully twice as broad as long; viewed from

in front the head is obviously broader than high; eyes large and prominent, nearly circular, sparsely hairy; face twice as broad as high; palpi short; antennae broken, the first flagellar joint about two and one-half times as long as thick, following joints shorter; mesoscutum faintly alutaceous and subopaque, with a few obscure wrinkles following the subobsolete notauli, the anterior one-third with some distinct rugosities or subobsolete punctures; propodeum nearly smooth above but with its posterior face and lateral margins distinctly rugulose, the petiolar area concave, much broader than long and more or less transversely wrinkled within; the lateral areas of posterior face of propodeum small and mostly restricted to the lateral angles; pleura smooth; legs normal; stigma of forewing short and broad, emitting the radius at the middle; metacarpus distinctly longer than the stigma; radius short, somewhat thickened basally, its first abscissa less than twice as long as the stub of second, which is a little longer than the intercubitus; brachial cell closed; abdomen one and one-half times as long as the thorax, the first tergite rugose, twice as broad at apex as at base; ovipositor sheaths rather broad and short. General color reddish testaceous; metanotum, propodeum, apical half or more of third, fourth, and fifth and all of following abdominal segments dark brownish to blackish; scape and pedicel testaceous, flagellum blackish; legs concolorous with thorax, the posterior femora and tibiae suffused with brownish; wings hyaline; venation brownish, the costal and basal veins darker than the others, and the median and submedian veins mostly pale; stigma at base and narrowly along the anterior margin pale, otherwise brownish.

Male unknown.

*Type locality*.—Taihoku, Formosa.

*Type*.—Cat. No. 28984, U.S.N.M.

*Host*.—*Dilachnus*, species.

One female received from T. Shiraki and said to have been parasitic upon an unidentified species of *Dilachnus*, collected by R. Takahashi. The type has lost one pair of wings and both antennae are broken.

#### APHIDIUS COMMODUS, new species

This species agrees very closely with the description of *pseudoplatani* Marshall except that the palpi are not unusually long and the ovipositor sheath is not curved downward at apex. Structurally it is very similar to *colemani* Viereck but may be readily distinguished by its yellowish color.

*Female*.—Length 2.5 mm. Smooth and shining, the first tergite weakly rugulose. Head transverse, as broad as the thorax, narrowed behind the eyes; eyes converging below; distance from antennal fossae to apex of clypeus a little greater than the shortest distance

between the eyes; palpi normal, not elongate; antennae 16-jointed, approximately two-thirds as long as the body, the third joint (first flagellar joint) nearly four times as long as thick, following joints shorter, the fifteenth about twice as long as broad, the sixteenth longer than the third and nearly twice as long as the fifteenth; notauli effaced except at the anterior angles of mesonotum; propodeum smooth and distinctly areolated, the petiolar area very narrow, a little broader anteriorly than posteriorly; wings normal, the first abscissa of radius about twice as long as the stub of second, which is subequal to the intercubitus; brachial cell complete; abdomen one and one-half times the head and thorax in length, the first tergite a little broader at apex than at base, a little more than twice as long as broad at apex, and weakly rugulose; ovipositor sheaths normal. General color reddish testaceous, the propodeum and second and third abdominal segments suffused with brownish; legs concolorous with the thorax but with the middle and hind femora, the hind tibiae, and all tarsi more or less tinged with brownish; antennal scape and pedicel testaceous, the flagellum brownish black; wings hyaline, basal vein and costal vein toward apex brownish, stigma and remaining veins pale; ovipositor sheaths blackish.

*Male*.—Length 1.75 mm. Antennae 18-jointed, the apical joint small and shorter than the preceding, the third joint the longest and about three times as long as thick; face very slightly shorter than the shortest distance between the eyes; head above and dorsum of thorax dark brown, approaching piceous; abdomen, except first segment fuscous; hind legs mostly dark brownish. Otherwise agrees with female.

*Type locality*.—Taihoku, Formosa.

*Type*.—Cat. No. 28985, U.S.N.M.

*Host*.—*Macrosiphoniella formosartemisiae* Takahashi.

Four females and one male received by the Bureau of Entomology from T. Shiraki and said to have been reared from the above-mentioned aphid April 20, 1922, by R. Takahashi.

TRIOXYS COMMUNIS, new species

Easily distinguished from *struma* by the absence of toothlike elevations on the pronotum and by its darker color. Resembles the American species *ovalis* Provancher but differs by having the ovipositor sheaths a little longer and the color of legs a little more obscure. Also similar to *aceris* Haliday, differing chiefly in the darker color of thorax and abdomen.

*Female*.—Length 1.2 mm. Smooth and shining. Head viewed from above about twice as broad as long; viewed from in front a little broader than high; vertex arched; eyes slightly converging

anteriorly; antennae inserted on middle of head and not distinctly above middle of eyes, 11-jointed, approximately two-thirds as long as the body, scape barely longer than broad, pedicel globose, flagellar joints about two and one-half times as long as thick, except the last, which is about equal to the two preceding joints together; pronotum normal, without a conspicuous elevated area medially and without toothlike projections laterally, but usually with a very inconspicuous fovea or weak longitudinal fold on each side near the middle; notauli weakly impressed at the lateral anterior angles of the mesonotum, entirely effaced on the dorsum; propodeum completely but very delicately areolated and its posterior face very faintly rugulose; abdomen about one and one-third times the length of head and thorax, smooth, the first tergite rather narrow with a slight constriction between middle and apex, the spiracles at the middle and not prominent; anal prongs distinctly longer than the first tergite; ovipositor sheaths approximately half as long as the anal prongs, very nearly as broad at apex as at base, and only slightly curved; wings normal, the radius extending a little more than halfway to the wing margin; first brachial cell mostly effaced. Head and thorax black; scape, pedicel, two or three basal joints of flagellum, and the mouth pale yellowish; collar and propodeum usually somewhat piceous; legs fusco-testaceous; first segment of abdomen pale, remainder of abdomen, including the anal prongs and ovipositor sheath, brownish black; wings hyaline, stigma and radius pale; basal vein dark.

*Male*.—Length 1.1 mm. Antennae 13-jointed; legs usually a little more strongly infuscated than in the female. Otherwise agrees with female.

*Type locality*.—Taihoku, Formosa.

*Type*.—Cat. No. 28987, U.S.N.M.

*Host*.—*Aphis gossypii* Glover.

Two females and four males received from T. Shiraki, reared August 30, 1922, by R. Takahashi.

#### TRIOXYS STRUMA, new species

This species may be distinguished at once from all others known to the writer by the presence on the middle of the pronotum or collar of an elevated area which is broader than long and nearly flat above, with its lateral anterior angles prominent, in lateral view appearing as a blunt tooth on each side of the pronotum.

*Female*.—Length 2.6 mm. Smooth and polished. Head, viewed from above, transverse; viewed from in front slightly broader than high, the vertex strongly arched above the eyes; eyes slightly converging below; antennae inserted about on middle of head but



somewhat above middle of eyes, 11-jointed and about two-thirds the length of body; scape somewhat longer than broad, pedicel nearly globose; joints 3 to 10 of antennae subequal and each about three times as long as thick, joint 11 distinctly the longest; pronotum as indicated above, the elevated area broader anteriorly than posteriorly and divided by a weak median longitudinal carina; notauli impressed at the lateral anterior angles of mesonotum, mostly effaced above but traceable as darker lines on mesonotum; propodeum smooth, distinctly areolated, the petiolar area pentangular and nearly as broad as long; abdomen smooth, one and one-third times as long as the head and thorax; first segment rather slender and nearly parallel-sided but with a distinct constriction at apex, the spiracles placed distinctly before the middle and not prominent; hornlike processes at apex of abdomen as long as the first tergite, the ovipositor sheath curved downward and moderately slender. Wings normal for the genus, the radius inclosing a little more than half the radial cell; first brachial cell complete. Pale testaceous; the antennae beyond the third joint, a band on abdomen embracing the apex of second and all of third tergite, the ovipositor sheath, and the apical joint of all tarsi brownish black; wings hyaline, the stigma whitish, veins mostly brownish, costa basally, and medius and submedius paler.

*Male*.—Length 2 mm. Antennae 13-jointed, as long as the body or nearly, the apical joint no longer than the preceding. Head and thorax above brownish yellow, beneath paler; scape and pedicel yellow, the rest of antennae black; abdomen mostly brownish black, the first and large part of second tergites testaceous; legs concolorous with underside of thorax; other characters as in the female.

*Type locality*.—Taihoku, Formosa.

*Type*.—Cat. No. 28986, U.S.N.M.

*Hosts*.—*Macrosiphoniella citricola* Van der Goot and *Greenidea ficicola* Takahashi.

Described from two female and two male specimens received through the Bureau of Entomology from T. Shiraki. Both females and one male were reared, according to Shiraki, from *Macrosiphoniella citricola* Van der Goot by R. Takahashi. One male was reared by the same collector from *Greenidea ficicola* Takahashi.

#### PRAON, species

One male specimen of a Praon which apparently is very close to *P. flavinode* Haliday was reared from *Macrosiphum formosanum* Takahashi, at Taihoku, Formosa, May 5, 1922.

**EPHEDRUS JAPONICUS** Ashmead

A series of 11 specimens of this species were reared February 7, 1922, from *Brachysiphoniella graminis* Takahashi at Taihoku, Formosa, by R. Takahashi, and 13 specimens of the same species from *Aphis rumicis* Linnaeus in March, 1922, by the same collector.

**DIAERETUS NIPPONENSIS** Ashmead

Two specimens identified as this species were reared January 24, 1922, from *Greenidea ficicola* Takahashi at Taihoku, Formosa, by R. Takahashi.

**LYSIPHLEBUS JAPONICUS** Ashmead

Three specimens reared April 4, 1922, and two specimens reared November 18, 1922, from *Toxoptera aurantii* Boyer by R. Takahashi at Taihoku, Formosa, have been identified as this species. The national collection also possesses nine specimens of this species reared from the orange aphid, June 21, 1917, at Shidzuokaken, Japan, by R. Yoshida.

**Superfamily CHALCIDOIDEA****Family PTEROMALIDAE****PACHYNEURON SIPHONOPHORAE** Ashmead

Five specimens which I am unable to distinguish from this common American species were reared at Taihoku, Formosa, from *Macrosiphum formosanum*.





# A REVIEW OF THE SOUTH AMERICAN TWO-WINGED FLIES OF THE FAMILY SYRPHIDAE

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The present contribution to the knowledge of the South American Syrphidae is mainly based on the collection in the United States National Museum. Additional material was borrowed from the British Museum through the kindness of Maj. E. E. Austen. In this material a number of new genera and species have been recognized and are herein described.

A paper now in press<sup>1</sup> contains a treatment of all the South American Xylotini known to the writer.

The Syrphidae of Chile have been treated as a unit several times by various authors. A large share of the present material is from Chile, and this has been treated in a separate section of the paper in order to preserve this unity.

The key which is here submitted for the determination of the genera of South American Syrphidae must be considered as a provisional one. The South American fauna is comparatively little known, and very probably many of the genera which exist there still await recognition. Most of the species known from this region were described prior to 1900, when the genera of this family were very imperfectly defined. This complicates the recognition of the old species and genera and makes for instability in the classification. The writer has found that about half of the genera are distinct from the Nearctic genera to which many of the old species had been assigned.

It is of interest to note that several of the larger genera and groups found in North America and Europe are as yet not authentically recorded from South America. These are the Chilosiini, Sericomyninae, *Merodon*, *Eumerus*, and Criorrhini.

The subfamilies given in the key are the same as those given in my previous key (Reclassification of the Subfamilies, Tribes, and Genera of North American Syrphidae<sup>2</sup>) save that *Nausigaster* is

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<sup>1</sup> Proc. U. S. Nat. Mus., vol. 69, art. 9. (Published on Dec. 1, 1926.)

<sup>2</sup> Shannon, Bull. Brooklyn Ent. Soc., vol. 16, 1921, pp. 67-69.

here included in the Chilosinae, thereby doing away with the Nausigasterinae. The genus is a highly modified one, but aside from its peculiarities it shows the subfamily characteristics of the Chilosinae.

The genus *Alipumilio* (new genus) is still more specialized than *Nausigaster*, inasmuch as the humeral calli are completely covered by the posterior part of the head, and consequently the calli are bare (a character heretofore recognized as peculiar to the Syrphinae), but this genus shows unmistakable relationships with the Chrysogasterini and is therefore retained in the Chilosinae. The absence of the spurious vein also removes it from the Syrphinae.

It must be understood that the characters used in the present key are chiefly applicable to the South American fauna. A rather scant representation of material permits the use of certain characters that probably would have to be abandoned if a key were made for both North and South America, or even if a larger representation of the South American material were available.

#### KEY TO THE SOUTH AMERICAN GENERA OF SYRPHIDAE

A<sup>1</sup>. Antenna with a terminal style ..... CERIOIDINAE.

B<sup>1</sup>. Antennifer less than half the length of first antennal joint.

*Cerioides* Rondani.

B<sup>2</sup>. Antennifer longer than length of first antennal joint.

*Monoceromyia* Shannon.

A<sup>2</sup>. Antenna with a dorsal arista.

B<sup>1</sup>. The humeral calli and the inter-humeral region destitute of pile (if spurious vein is absent see *Alipumilio*, Chilosinae); discal crossvein placed well before middle of discal cell; spurious vein always present; no stigmal cross vein; male, as well as female, with five visible abdominal segments ..... SYRPHINAE.

C<sup>1</sup>. Squamae, squamal cilia and plumula well developed, the cilia of the lower squama equal to at least half the length of haltere; flies usually of broad form.

D<sup>1</sup>. Face entirely black.

E<sup>1</sup>. Face much broader than length of arista.

F<sup>1</sup>. First antennal joint as long as second ..... *Melanostoma* Schiner.

F<sup>2</sup>. First joint much longer than second ..... *Braziliana* Curran.

E<sup>2</sup>. Face not broader than length of arista ..... *Xanthandrus* Verrall.

D<sup>2</sup>. Face largely yellow.

E<sup>3</sup>. Metasternum long pilose.

F<sup>3</sup>. Oral opening about twice as long as broad.

*Claraplumula*, new genus.

F<sup>2</sup>. Oral opening four or more times as long as broad.

*Fazia*, new genus.

E<sup>3</sup>. Metasternum bare.

F<sup>4</sup>. Wings without villosity, glassy in appearance; head large, inflated ..... *Scaeva* Fabricius.

F<sup>5</sup>. Wings villose, head normal ..... *Syrphus* Scopoli.

C<sup>2</sup>. Squamae, squamal cilia, and usually the plumula, considerably reduced (the upper squama usually vestigial, lower squama very narrow, lower squamal cilia less than half the length of haltere, usually very short; plumula sometimes absent); slender flies.

- D<sup>1</sup>. Second abdominal segment strongly constricted and several times longer than broad, or abdomen very long and slender throughout.
- E<sup>1</sup>. Third longitudinal vein deeply constricted into first posterior cell.  
Salpingogaster Schiner.
- E<sup>2</sup>. Third vein moderately curved downwards or straight.  
Baccha Fabricius.
- D<sup>2</sup>. Abdomen parallel sided or moderately constricted basally.
- E<sup>1</sup>. A distinct row of stiff, erect hairs across anterior margin of mesonotum.....Ocyptamus Macquart.
- E<sup>2</sup>. Without a distinct row of erect hairs across anterior margin of mesonotum.
- F<sup>1</sup>. Apical cross vein (post angular section) upright; a distinct black spot at apex of wing; second abdominal segment moderately constricted.....Calostigma, new genus.
- F<sup>2</sup>. Apical cross vein directed obliquely outward; wing without a black spot.....Mesogramma Loew and Allograpta Osten Sacken.
- B<sup>2</sup>. Humeral calli and region between them more or less covered with pile; male, and sometimes female, with only four visible abdominal segments (sometimes three) exclusive of hypopygium.
- C<sup>1</sup>. Antennae usually very elongate (either the first or third joints or both, elongated); discal cross vein joining discal cell well before the middle; stigmatical cross vein present; apical cross vein (post angular section) usually upright; spurs usually present on either the third or fourth vein which projects into first posterior cell; metasternum girdled with chitin; hind basitarsus usually thickened.  
MICRODONTINAE.
- D<sup>1</sup>. Second abdominal segment greatly broadened on basal half, strongly constricted on apical half; face swollen below.  
Rhopalosyrphus Giglio-Tos.
- D<sup>2</sup>. Second segment not broadened basally and constricted apically; face uniformly sloped.
- E<sup>1</sup>. Third vein with or without a spur; fourth vein without spurs; abdomen constricted on basal half of second segment or behind the third, or abdomen more or less ovate.....Microdon Meigen.
- E<sup>2</sup>. Third vein without spur but a spur present on the fourth vein and on apical cross vein; abdomen constricted on basal half of second segment.....Mixogaster Macquart.
- C<sup>2</sup>. Antennae rarely elongate; discal cross vein joining discal cell at or before middle; stigmatical cross vein rarely present (sometimes in Eristalinae); apical cross vein usually directed obliquely outward; third vein without, fourth vein rarely with spurs; metasternum usually membranous behind; hind metatarsus not thickened.
- D<sup>1</sup>. Arista with either long or very dense and short plumosity; face produced downwards; apical cross vein usually strongly recurrent on distal end; marginal cell usually closed; hypopleura with a tuft of pile; thorax usually with bristles.....VOLUCELLINAE.
- D<sup>2</sup>. Arista bare or very thinly pilose; apical cross vein not, or very slightly recurrent on distal end (except Alipumilio).
- E<sup>1</sup>. Third vein deeply looped into first posterior cell; facial slopes pilose; metasternum pilose.....ERISTALINAE.
- F<sup>1</sup>. Marginal cell closed and petiolated.
- G<sup>1</sup>. Thorax and abdomen with bands of tomentum.  
Meromacrus Rondani.

- G<sup>2</sup>. Thorax and abdomen without bands of tomentum (*Doliosyrphus*)-----*Eristalis* Latreille.
- F<sup>2</sup>. Marginal cell open.
- G<sup>3</sup>. Densely pilose, bumblebee like in appearance...*Mallota* Meigen.
- G<sup>4</sup>. Not densely pilose, unlike bumblebees in appearance.
- H<sup>1</sup>. Ocelli widely spaced; frontal lunule very large and broad; head much broader than high; males widely dichoptic.  
*Dolichogyna* Macquart.
- H<sup>2</sup>. Head, ocelli, and frontal lunule normal; males holoptic (always?).
- I<sup>1</sup>. Third antennal joint much longer than broad; first tergite with dense, appressed, yellow pile-----*Quichuana* Knab.
- I<sup>2</sup>. Third joint subquadrate.
- J<sup>1</sup>. Head broader than thorax; mesonotum without light stripes-----*Habromyia* Williston.
- J<sup>2</sup>. Head not broader than thorax; mesonotum with light longitudinal stripes-----*Helophilus* Meigen.
- E<sup>2</sup>. Third vein straight or moderately curved downwards; facial slopes usually bare (pilose in some *Chilosinae*).
- F<sup>1</sup>. Discal cross vein joining discal cell well before its middle; metasternum bare-----*CHILOSINAE*.
- G<sup>1</sup>. Apical cross vein (post angular section) directed obliquely inward; mesonotum distinctly broader than long.  
*Alipumilio*, new genus.
- G<sup>2</sup>. Apical cross vein not directed inward; mesonotum longer than broad.
- H<sup>1</sup>. Body deeply pitted; length of arista equal to width of third antennal joint-----*Nausigaster* Williston.
- H<sup>2</sup>. Body not noticeably pitted; arista longer than width of third joint.
- I<sup>1</sup>. Face distinctly pilose.
- J<sup>1</sup>. Arista longer than antenna, discal cross vein directed outward (*Pipiza*)-----*Penium* Philippi.
- J<sup>2</sup>. Arista much shorter than antenna; discal cross vein (~~post~~ angular section) directed upwards, then outwards on distal half-----*Halictomyia*, new genus.
- I<sup>2</sup>. Face bare.
- J<sup>1</sup>. Frons and face rugose, apical cross vein upright.  
*Chrysogaster* Williston.
- J<sup>2</sup>. Frons and face not rugose; apical cross vein directed outward.
- K<sup>1</sup>. Body pile modified, scalelike; metasternum membranous behind.
- L<sup>1</sup>. Antenna moderate, second and third joints as long as broad-----*Eumyiolepta* Shannon.
- L<sup>2</sup>. Antenna much elongated, second and third joints much longer than broad-----*Lepidostola* Mik.
- K<sup>2</sup>. Body pile normal, composed of fine hairs; metasternum girdled with chitin.
- L<sup>1</sup>. Face with a straight keel; a transverse row of small black spines on anterior margin of mesonotum; male holoptic-----*Zonemyia* Shannon.

- L<sup>2</sup>. Face tuberculate in male, concave in female; no transverse row of spines on mesonotum; male dichoptic-----*Valdivia*, new genus.
- F<sup>2</sup>. Discal cross vein joining discal cell near or beyond the middle (*Zonemyia* may be confused here but the transverse row of spines noted above will serve to separate this genus).

## XYLOTINAE

G<sup>1</sup>. Metasternum pilose.

- H<sup>1</sup>. Hind femur with one or two apical toothlike processes ventrally.

I<sup>1</sup>. Hind femoral process consisting of one tooth; hind coxa without spur (*Ortholophus* Bigot)-----*Tropidia* Meigen.

I<sup>2</sup>. Hind femoral process bidentate; hind coxa with small spur.

J<sup>1</sup>. Body very elongate; discal cross vein simple; male holoptic-----*Acrochordonodes* Bigot.

J<sup>2</sup>. Body broad; discal cross vein with a free-ending branch; male dichoptic-----*Stilbosoma* Philippi.

H<sup>2</sup>. Hind femur without apical process; face subcarinate.

I<sup>1</sup>. Wings nearly devoid of villi, glassy in appearance; arista shorter than width of face.

*Syritta* St. Fargeau and Serville.

I<sup>2</sup>. Wings villose, not glassy; arista distinctly longer than width of face-----*Planes* Rondani.

G<sup>1</sup>. Metasternum pubescent or bare.

H<sup>1</sup>. Body dark colored.

I<sup>1</sup>. Face black, with a median longitudinal ridge and two oblique ridges.

J<sup>1</sup>. Abdomen strongly constricted basally.

*Tatuomyia* Shannon.

J<sup>2</sup>. Abdomen of nearly uniform width-----*Crepidomyia* Shannon.

I<sup>2</sup>. Face bright yellow with an obtuse longitudinal ridge; metathoracic spiracle distinctly larger than third antennal joint; hind trochanters of male spurred.

*Sterphus* Philippi.

I<sup>2</sup>. Face bluish black, gently concave in profile; metathoracic spiracle much smaller than third antennal joint; hind trochanters simple-----*Philippimyia* Shannon.

H<sup>2</sup>. Body entirely reddish yellow; very large and robust.

*Eriophora* Philippi.

The following genera have been recorded from South America, but as there is no material at hand from which good characters may be chosen to key them they have not been included.

## Subfamily SYRPHINAE

*Paragus* Latreille:

*annulipes* Macquart-----Brazil.

*ruficaudatus* Bigot-----Brazil.

*Epistrophe* Walker:

*imitator* Curran-----Venezuela.

*Doros* Meigen:

?*Doros odyneroideus* Philippi-----Chile.



This species very evidently belongs to some other genus than to *Doros* and probably belongs to the subfamily Chilosinae. The species may come in the genus herein described under the name *Valdivia*.

### Subfamily CHILOSINAE

#### *Pia* Philippi:

*cyanea* Philippi----- Chile.

#### *Trichopsomyia* Williston:

*polita, puella, tuberculata, longicornis* Williston----- Brazil.

#### *Sphegina* Meigen:

?*Sphegina chiragra* Fabricius----- South America.

#### *Argentinomyia* F. Lynch—A:

*testaceipes* F. Lynch—A----- Argentina.

#### *Myiolepta* Newman:

*haemorrhoidalis* Philippi----- Chile.

*luctuosa* Bigot----- Chile.

It is very doubtful if either of these species belong to *Myiolepta*.

#### *Rhingia* Scopoli:

*nigra* Macquart----- Columbia.

*harrisi* Curran----- Brazil.

### Subfamily VOLUCELLINAE

This subfamily is greatly in need of revision.

#### *Volucella* Geoffrey.

#### *Glaurotricha* Thomson.

#### *Phalacromyia* Rondani.

#### *Temnocera* St. Fargeau and Serville.

*Viereckomyia* Curran----- Columbia.

#### *Apophysophora* Williston:

*hirtipes* Macquart----- Brazil.

#### *Lepidopsis* Curran:

*compactus* Curran----- Brazil.

### Subfamily XYLOTINAE

#### *Macrometopia* Philippi:

*atra* Philippi----- Chile.

#### *Pterallastes* Loew:

*nubeculosus* Van der Wulp----- Argentina.

#### *Promilesia* F. Lynch—A:

*nectarinoides* F. Lynch—A----- Argentina.

#### *Spilomyia* Meigen:

*gratiosa* Van der Wulp----- Argentina.

#### *Ceriogaster* Williston:

*foscithorax* Williston----- Brazil.

### DESCRIPTIONS OF NEW SPECIES FROM COUNTRIES OTHER THAN CHILE

### Subfamily SYRPHINAE

#### XANTHANDRUS FLAVOMACULATUS, new species

*Male*.—A species easily recognized by the presence of an additional pair of large, yellow spots on the second tergite. Head large, entirely

black; ocellar and frontal triangles with black pile; antennal pits confluent; antennae fairly large, dark brown, reddish brown on lower portions; arista longer than antenna, reddish brown; face pale pollinose and pilose, save on the small shining tubercle; face receding downward, narrow, being about one-fourth the width of the head; mesonotum bronzy aeneous with fulvous pile; legs black, the apices of femora and bases of tibiae yellowish brown; fore legs unmodified; abdomen black; tergites two, three, and four, each with a pair of large, subquadrate, yellow spots; wings slightly smoky; apical cross vein nearly in line with posterior cross vein; halteres yellow. Length 8.5 mm.; wing 8 mm. One male.

Differs from *X. bucephalus* (Wiedemann) in having an additional pair of yellow abdominal spots present on second tergite.

*Type locality*.—Rurrenabaque, Beni, Bolivia (W. M. Mann, Mulford Biological Expedition), 1921–22.

*Type*.—Cat. No. 28754, U.S.N.M.

#### Genus BRAZILIANA Curran

*Braziliana* CURRAN, Ann. Mag. Nat. His., ser. 9, vol. 16, 1925, p. 243.

*Genotype*.—(*Melanostoma*) *Braziliana longicornis* (Williston), by original designation.

#### BRAZILIANA PERUVIANA, new species

*Male*.—Closely allied to the genotype. Antenna elongate and slender, the first joint more than four times as long as broad, rather gently but distinctly bent basally, the outer two-thirds directed obliquely downward; second joint less than half the length of the first; the third nearly as long as the first; arista nearly equal to the combined length of the first two joints; face black, the sides with violet and coppery reflections, broadly pollinose and punctate; mesonotum bronzy aeneous with a pair of rather broad but very indistinct, pollinose stripes, clothed with brownish pile; anterior legs golden yellow, tarsi darker; midfemur brownish, becoming yellow apically, tibia and tarsus yellow; hind femur yellow on basal fourth, suddenly becoming shining very dark brown on remaining portion; tibia shining dark brown; tarsus yellow; abdomen very slightly constricted, blackish; third tergite with a pair of rather obscure yellow spots; wings entirely brownish. Length, 9 mm.; wing 7 mm.

One male.

*B. longicornis* differs in having the wings largely hyaline; the abdomen of the male is more constricted, as "it does not attain its full width till the tip of the third segment."

*Type locality*.—Rio Charape, Peru (September 13, C. H. T. Townsend).

*Type*.—Cat. No. 28755, U.S.N.M.

**CLARAPLUMULA, new genus**

*Genotype*.—*Claraplumula latifacies*, new species.

Of the tribe Syrphini. Head large, inflated, broader than the thorax; face yellow, very broad, nearly quadrate; antennae very widely separated, the distance between them nearly equal to length of antenna; below, on each side of face, is a deep slit; metasternum long pilose; wing entirely villose; plumula large; tergites two, three, four, and five each with a pair of large yellow spots.

The pilose metasternum separate this genus from all other Syrphinae except *Asarcina* (Oriental) and *Fazia* (see below). It is further separated from *Syrphus* by the large inflated head and widely separated antennae; from *Scaeva* by the villosity of the wings, and from *Fazia* by the broader face, less protruding oral margin, and much broader oral opening. In *Claraplumula* the oral opening is about twice as long as broad; likewise the torma is twice as long as broad; in *Fazia* the oral opening is very long and narrow, being more than four times as long as broad, and the torma is about four times as long as broad.

**CLARAPLUMULA LATIFACIES, new species**

Readily recognized by the large head, the four pairs of large yellow spots on the abdomen, and the smoky wings.

*Male*.—Ocellar triangle rather small, black pilose; frontal triangle very broad, black pilose; basal antennal joints yellowish brown, the third darkened; arista arising near base of third joint, black, slightly longer than antenna; face yellowish, with sparse, black hairs; very broad, in profile nearly straight from antennal base to the protuberance, thence rather sharply retreating to the anterior oral margin which is slightly produced; jowls very broad, more or less aeneous and pale pilose; mesonotum aeneous, with a pair of faint stripes, sides yellowish, scutellum yellowish; femora and tibia reddish brown, tarsi darker; abdomen black with four pairs of large yellow spots, anterior corners also yellow; wings smoky. Length 13 mm.; wing 11.5 mm.

Two males.

*Type locality*.—Tincochaca, 7,000 feet, Peru, Yale Peruvian Expedition (August 9, 1911). Also Paltaybamba, 5,000 feet, Peru.

*Type*.—Cat. No. 28768, U.S.N.M.

**CALOSTIGMA, new genus**

*Genotype*.—*Calostigma elnora*, new species.

Two female specimens representing a new genus and species are at hand from Bolivia, which possess two unique characteristics for the subfamily, Syrphinae, in which they belong.

Head hemispherical, circular in outline (frontal view), face projecting beyond antennal prominence; front unusually narrow; ocelli well advanced of occipital margin; eye nearly bordering onto oral margin; posterior oral region yellow; dorsum of thorax bounded by a yellow margin; metapleura yellow; abdomen constricted basally; tergites three, four, and five, each with five longitudinal yellow stripes; post angular section of apical cross vein straight and joining third vein at right angles; a conspicuous dark spot at tip of wing. (Fig. 5.)

This genus is perhaps closest to *Mesogramma*. The straight and upright apical cross vein and the apical spot in the wing serve to differentiate the two.

**CALOSTIGMA ELNORA, new species**

*Female*.—Face and front yellow, save for a black spot immediately above base of antennae and the ocellar region; antennae small, yellow; mesonotum shining black with a median longitudinal pale pollinose stripe and a pair of similar but submedian stripes which extend but half the length of mesonotum; sides of mesonotum yellow; scutellum yellow, the disk black; fore and mid legs yellow; hind femur yellow with a rather broad preapical dark ring; hind tibia black with a median bright yellow ring; hind tarsi yellowish, becoming darker apically; abdomen narrowed at juncture of first and second segments, the second widening posteriorly; first tergite black, the sides yellow; the second yellow with hind border black and two pairs of longitudinal black stripes; third, fourth, and fifth tergites black, each with five longitudinal yellow stripes; wings hyaline with the entire subcostal cell infuscated and a black spot at tip of wing; halteres yellow; plumula absent.

Length 6 mm.; wing 5 mm.

*Type locality*.—Rurrenabaque, Beni, Bolivia (November 1921, W. M. Mann, Mulford Biological Expedition).

*Type*.—Cat. No. 28756, U.S.N.M.

This pretty little species is named after my wife, Elnora S. Shannon.

**ALLOGRAPTA PIURANA, new species**

*Female*.—Resembles *A. hortensis* Philippi in having the distinct shining black stripe extending from oral margin upwards to the hind occipital margin. Differs in having a distinct light yellow spot on metapleura, hind margin of scutellum black; the spots on the second tergite directed obliquely backwards and those on the remaining segments nearly parallel to each other. (Fig. 4.)

Length 7 mm.; wing 5 mm.

*Type locality*.—Department Piura, Peru (January 11, C. H. T. Townsend).

*Type*.—Cat. No. 28757, U.S.N.M.

## Genus BACCHA Fabricius

## PELECINOBACCHA, new subgenus

*Subgenotype*.—*Baccha* (*Pelecinozaccha*) *peruviana*, new species.

Belongs to the genus *Baccha* but may be readily separated by the extraordinary elongate and slender abdomen of the female, which is cylindrical and nearly twice the length of the wing (17.5:10.5) and consists of six visible segments, all of equal length (except the first). The last segment, however, must be part of the usually retracted and very small first joint of the ovipositor. Differs from the preceding segments in being composed of a single band of chitin without any sternal sclerite, or even a suture on the ventral side. Post angular section of cross vein is shorter than posterior cross vein; alula well developed.

The male shows no unusual type of abdominal modification.

## BACCHA (PELECINOBACCHA) PERUVIANA, new species

Fairly large, blackish to brownish species, the wings infuscated except on outer third.

*Male*.—Head large; ocelli well advanced of hind occipital margin; frontal triangle large, blackish with dark pile; frontal lunule large, semicircular; face fairly broad, narrowing gradually downward; sides of face yellowish; remainder brownish; tubercle well developed; lower margin of eye separated from oral margin by less than one-half of the width of third antennal joint; thorax brownish, humeri, post alar calli and scutellum faintly tinged with yellow; legs brownish (hind legs lacking); abdomen elongate, gradually tapered; segments two, three, and four of equal length.

*Female*.—Front narrow at vertex, the width less than length of arista; ocelli remote from hind occipital margin; front above antennae broad as in male; hind legs blackish, the basal three-fourths of hind tarsi black, remainder of tarsus pale yellow; wings infuscated, nearly hyaline on posterior border and apical fourth of wing.

Length of male 14.5 mm.; of female 24.5 mm.; wing 10.5 mm.

*Type locality*.—Chauchamayo, Peru (W. F. H. Rosenberg).

*Type*.—Cat. No. 28761, U.S.N.M.

Female type, male allotype, one female paratype.

This species bears a superficial resemblance to *Pelecinus polyturata* (Hymenoptera) in which the female has a remarkably long and slender abdomen and the male has a clubbed abdomen.

## BACCHA (BACCHA) MICROPELECINA, new species

*Female*.—Resembles *Baccha* (*Pelecinozaccha*) *peruviana* in having an elongate abdomen, nearly twice the length of the wing (9:5), but the fifth and sixth segments, while well developed, are much shorter

than the preceding segments and broader, giving the abdomen a subspatulate form. The fifth sternite is subquadrate; the sixth segment is a continuous cylinder of chitin without sutures. It differs further in having the alula greatly reduced. Therefore, the species is not placed in the same subgenus, *Pelecinozaccha*.

Head dark aeneous; frontal lunule large and rugose; antennae rather small, brown; facial tubercle well developed; face moderately narrowed, nearly parallel-sided; mesonotum bluish aeneous with three longitudinal vittae; fore and mid femora and tibiae yellow, the tarsi blackened; hind femur with a dark preapical ring; hind tibia yellow basally, black beyond, the tarsus black; abdomen dark; an interrupted yellow band beyond middle of second tergite; third and fourth tergites yellowish basally; wings hyaline, except narrowly on anterior border as far as tip of first vein; distal section of apical cross vein shorter than posterior cross vein; squamae greatly reduced. Length, 11.5 mm.; wing, 5 mm.

One specimen.

*Type locality*.—Tumupasa, Bolivia (December, 1921, W. M. Mann, Mulford Biological Expedition, 1921–22).

*Type*.—Cat. No. 28760, U.S.N.M.

▼  
**BACCHA (BACCHA) PUNCTATA, new species**

*Male*.—This is a well-marked species, closely allied to *hirta* (the following species) but lacks the long vestiture. Blackish species, frontal triangle very large, higher than broad, the upper half opaque black with a pair of silvery pollinose spots, lower portion bluish aeneous; lower margin of eye narrowly separated from oral margin; legs entirely black; mesonotum opaque black with several aeneous longitudinal vittae; first tergite aeneous, the second aeneous with a large triangular and opaque preapical mark which contains a pair of yellow dots; disk of third, fourth, and fifth tergites opaque black and each with four yellow dots; wings infuscated basally, hyaline apically; squamae, squamal cilia and plumula dark brown.

Length 12 mm.; wing 9.5 mm.

One specimen.

*Type locality*.—San Antonio, Beni, Bolivia (November, 1921, W. M. Mann, Mulford Biological Expedition).

*Type*.—Cat. No. 28758, U.S.N.M.

**BACCHA (BACCHA) HIRTA, new species**

*Male*.—An easily recognized species because of its unusually long, stiff, erect, and black vestiture, a unique character in this genus. Head black; frontal lunule large, with a pair of reddish brown spots, one above each antenna; frontal triangle large, face fairly broad, but little converging downward; eyes narrowly separated

from oral margin; thorax black, with black erect hairs; fore and mid legs brownish; mid femora rather long pilose; hind legs black, the second and third joints yellowish, the femur and tibia clothed with black, shaggy hair; abdomen spatulate, black; first tergite with long black hairs; second tergite bluish aeneous, an opaque black band beyond middle; third and fourth tergites with aeneous cross-bands on fore and hind margins; distal section of apical cross vein longer than posterior cross vein; alula unusually large; bases of wings infuscated; squamae dark with dark cilia; length 9 mm.; wing 7 mm.

*Type locality*.—Ivon, Beni, Bolivia (February, 1922, W. M. Mann, Mulford Biological Expedition).

*Type*.—Cat. No. 28759, U.S.N.M.

### Subfamily CHILOSINAE

#### ALIPUMILIO, new genus

*Genotype*.—*Alipumilio femoratus*, new species.

A very unusual type of Syrphidae allied to *Psilota* and the Chrysogasterini. Disproportionately short and thick in appearance, body entirely black and finely punctated, clothed everywhere with microscopic pile except on parts of abdomen. Head large, subcircular in outline (frontal aspect); eyes very densely and very short pilose, and very large, their hind margins forming the hind margins of the head, the occipital region being crowded out except for a small portion at vertex; front very long and narrow, widening downward, finely punctate; ocelli placed very close to hind occipital margin; antennae fairly large, placed below middle of head; face narrow, slightly converging downward, deeply and evenly concaved between antennae and oral margin; head set solidly against the thorax; the humeral callus flattened into a single plane which is frontal and is hidden by the head; no pile perceptible on the callus; prosternum more than twice as broad as long; anterior thoracic spiracle on cephalic aspect of thorax; mesonotum much broader than long; scutellum broad, hind margin flattened into a thin edge; hind femur very large, spinose beneath, spurious vein absent; apical cross vein with angle placed at middle, upper portion directed somewhat basad; plumula well developed. (Figs. 1, 2, and 3.)

#### ALIPUMILIO FEMORATUS, new species

*Female*.—Antenna brownish; third joint nearly twice as long as broad, in width two-thirds as wide as the front at vertex; lower part of face bluish; anterior oral margin light yellow; legs black, tips of tibiae and tarsi reddish yellow; tarsi unusually short and rather thick; hind tibia arcuate; abdomen with bright yellow tomentum

on sides of second tergite, on sides and through the middle of third tergite, and on entire surface of fourth and fifth (?) tergites; wings faintly smoky; spurious vein absent; squamae white with long, branched cilia; plumula present. Length 7 mm.; wing 5.5 mm.

One female.

*Type locality*.—Amazon (1866, H. W. Bates).

*Type*.—In British Museum.

#### HALICTOMYIA, new genus

*Genotype*.—*Halictomyia boliviensis*, new species.

Belongs to the tribe Chrysogasterini. Eyes pilose; front and face entirely shining black and pale pilose; occiput swollen; antennal pits separated; antennae elongate, extending a little below oral margin; third joint one and one-half times length of the basal two; arista shorter than third joint; face with a slight median tubercle; oral margin of very nearly even contour, with a slight and very broad frontal emargination; legs unusually long pilose (for this group); post angular section of apical cross vein directed straight upward for more than one-half its length, then outward; posterior cross vein very short and joining fourth vein, at nearly right angles, being slightly directed inward. (Fig. 6.)

The genus partakes of some of the characters of the Microdontinae.

#### HALICTOMYIA BOLIVIENSIS, new species

*Female*.—Rather small, entirely dark aeneous species, with an appearance similar to that of certain bees of the genus *Halictus*. Eye densely but very short pilose, a nearly bare transverse stripe on upper third; ocellar pile black, remainder of pile on front and face pale, downy in appearance; face converging slightly downward; tubercle inconspicuous; lower margin of eye separated by less than the width of third antennal joint; mesonotum entirely dark aeneous, pale pilose; all femora dark aeneous, apices yellowish brown; fore and mid tibia yellow brown, black pilose; first three joints of fore and mid tarsi whitish, the fourth and fifth joints blackish; hind femur rather swollen, pale pilose; hind tibia and basal three-fourths of basitarsus black, with rather long and erect black hairs; apex of basitarsus and second and third joints whitish with pale pile; last two joints blackish; abdomen pale pilose, shining bluish aeneous; hind margins of second and third tergites opaque black; wings hyaline, a faint clouding in the middle; squamae, halteres and plumula whitish, the latter well developed. Length, 6 mm.; wing, 4.5 mm.

One female.

*Type locality*.—Cavinas, Beni, Bolivia (W. M. Mann, Mulford Biological Expedition, 1921–1922).

*Type*.—Cat. No. 28762, U.S.N.M.



## EUMYIOLEPTA BRAZILIANA, new species

*Male*.—A rather small dark species with scalelike vestiture only on the thorax. Eyes contiguous; ocellar triangle small, shining black; frontal triangle shining brown, bordered with silvery pollen; antennae moderate, reddish yellow; arista darker; face tuberculate, a median longitudinal shining stripe; sides silvery pollinose, jowls shining; thorax dark brown, the scales sparse, whitish; legs yellowish brown, all the femora spinose beneath; abdomen dark brown, second and third tergites each with a pair of brownish lateral spots; wings subhyaline, a faint cloud on anterior border near the apex; apical cross vein twice angled with short spurs at the apices of the angles; posterior cross vein with an inward angle at its middle, which is also spurred; petiole beyond anal cell unusually long, nearly equal to the section of fifth vein preceding it; spurious vein absent; halteres bright yellow; plumula present. Length, 5 mm.; wing, 5 mm.

One specimen.

*Type locality*.—Theresopolis, Brazil (November 30, 1887).

*Type*.—In British Museum.

## Subfamily ERISTALINAE

## Genus QUICHUANA Knab

*Quichuana* KNAB, INS. INS. MENS., vol. 1, 1913, p. 13.—SHANNON, Proc. Ent. Soc. Wash., vol. 27, 1925, p. 111.

*Genotype*.—*Quichuana sylvicola* Knab.

The genus *Quichuana* was erected by Knab to contain two new species of Neotropical Syrphidae. Knab also stated his belief that *Mallota championi* Williston belonged here too.

Later investigations indicate that this genus is a natural and fairly large one and apparently confined to the neotropic region. The writer early in 1925 described two new species and during the summer of the same year saw five additional species, including *Mallota championi* Williston, in various European collections. Each of these five species has been described under a different generic name.

A list of the species is here appended together with some of the outstanding characteristics. Most of these species are very closely related, and in order to work out a synoptic key for them one should have specimens at hand.

*Quichuana sylvicola* KNAB, INS. INS. MENS., vol. 1, 1913, p. 14 (type in U.S.N.M.).

*Quichuana picadoi* KNAB, INS. INS. MENS., vol. 1, 1913, p. 14 (In U.S.N.M.).

*Quichuana inca* SHANNON, Proc. Ent. Soc. Wash., vol. 27, 1925, p. 111 (In U.S.N.M.).

*Quichuana calathea* SHANNON, Proc. Ent. Soc. Wash., vol. 27, 1925, p. 111 (In U.S.N.M.).

*Quichuana knabi*, new species, described below. (In U.S.N.M.)

(*Xylota*) *Quichuana subcostalis* (WALKER), Trans. Ent. Soc. London, n. ser, vol. 5, 1860, p. 291, Mexico (In British Museum).

(*Platynochaetus*) *Quichuana niger* (Giglio-Tos) BOLLET, Mus. Zool. ed Anat. Comp., Torino, vol. 7, 1892, p. 6, Mexico (In Museo Storia Natural, Torino, Italy).

Antennal joints 1:1.5:4; abdomen black, basal segment yellow pilose. This species may prove to be a synonym of the above.

(*Merodon*) *Quichuana angustiventris* (MACQUART), Dipt. Exot., suppl. 5, 1855, p. 90, South America (Brazil?) (In Museum d'Histoire Naturelle, Paris).

A beautiful species, remarkable for the very large and bright golden pilose frontal triangle in the male.

(*Helophilus*) *Quichuana auratus* (WALKER), Trans. Ent. Soc. London, n. ser. 4, 1857, p. 153: Amazon? (In British Museum).

(*Merodon*) = *Quichuana angustiventris* (Macquart).

#### QUICHUANA KNABI, new species

*Female*.—Very similar to *Q. calethea* Shannon from Panama, but differs in having the antennal joints 1:2:4, the arista equal to length of antenna. In *calethea* the antennal joints are 1:1.5:3.5, the arista longer than length of antenna; legs more extensively reddish yellow, base and apex of hind femur reddish yellow, remainder darkened; entire anterior border of wing infuscated, incompletely infuscated in *calathea*.

Length 11 mm.; wing 8 mm.

*Type locality*.—Cavinas, Beni, Bolivia (January, 1922, W. M. Mann, Mulford Biological Expedition).

*Type*.—Cat. No. 28763, U.S.N.M.

#### Genus HABROMYIA Williston

*Habromyia* WILLISTON, Trans. Amer. Ent. Soc. Phila., vol. 15, 1888, p. 284.

*Genotype*.—*Habromyia coeruleithorax* Williston (Trans. Amer. Ent. Soc. Phila., vol. 15, 1888, p. 284).

Two species of this genus are at hand, one of them apparently conspecific with the genotype. The genus may be separated from *Mallota* by its elongate and nearly bare body, head broader than thorax, eyes of male narrowly separated, eyes bare; third vein deeply looped; first submarginal cell open; anterior border of wing infuscated, posterior half hyaline.

#### HABROMYIA COERULEITHORAX Williston

The genotype *coeruleithorax* has the head and thorax black, a yellow spot above antennae.

#### HABROMYIA FLAVIFACIES, new species

*Male and female*.—Easily separated from *coeruleithorax* by having the front, face, and antennae bright yellow in the male, brownish

yellow in the female, the antenna and arista reddish yellow; scutellum yellowish, anterior margin narrowly black; sides of first tergite yellow; infuscation of the wing not extending beyond fourth vein except in second subbasal cell but this is only partially infuscated; apical portion of infuscation yellowish. In the genotype the brown borders the fifth vein behind to the base of the last posterior cell, and extends thence to the posterior angle of the first posterior cell, filling out this cell.

One male, one female.

*Type locality*.—Amazon (H. W. Bates).

*Type*.—Male, allotype, female. In British Museum.

**MALLOTA INVERSA, new species**

*Female*.—A typical species of *Mallota* with pilose eyes. Frons black pilose, rather broad, opaque brown, lower portion shining black; antennae dark brown; face broad, concave between antennae and facial tubercle which is moderate; sides of face with long, sparse pile; anterior half of mesonotum with black and yellow pile intermixed, posterior half and scutellum black pilose, a few yellow hairs on hind margin of scutellum; legs dark brown, tarsi paler; hind femur moderately enlarged with long dark pile; hind tibia arcuate with closely appressed black pile along hind margin; second and the basal half of third tergites reddish yellow pilose; apical half of third black pilose, the fourth and fifth tergites yellow pilose; wings with the veins broadly infuscated except at apex of wing, remainder of wing hyaline; squamae and squamal cilia black. Length 17 mm.; wing 13 mm.

*Mallota colombii* Macquart has the thoracic dorsum red pilose, the first three abdominal segments black pilose and the fourth and fifth red pilose. In *M. analis* Macquart, the thoracic dorsum is entirely yellowish pilose and the abdomen is largely yellowish pilose.

Two females.

*Type locality*.—Chanchamayo, Peru (W. F. H. Rosenberg). Also Piches and Perene, Peru, 2,000–3,000 feet. (Soc. Georg de Lima.)

*Type*.—Cat. No. 28764, U.S.N.M.

**MALLOTA NIGRA, new species**

*Female*.—An almost entirely black species differing from *inversa* in having the thoracic dorsum black pilose save for a few yellow hairs on anterior margin and hind margin of scutellum; legs black, all femora with long, rather dense, black pile; abdomen black pilose on first, second and basal half of third segment; remainder of abdomen with sparse yellow hairs; wings infuscated, very faintly so at apex and on posterior margin; length 12 mm.; wing 10 mm.

One female.

*Type locality*.—Santa Inéz, Ecuador (R. Haensch).

*Type*.—In British Museum.

**MALLOTA ABERRANS, new species**

This is not a typical species of *Mallota* but it seems to possess no characters of sufficient importance to make a separate genus for it. It may be easily recognized by its rather short yellowish pile and a pair of pale transverse spots on the second tergite.

*Female*.—Head rather broad and flat; eyes bare; front clothed with yellow and black pile; antenna normal, brownish; arista yellowish; face shining black, deeply concave, tubercle prominent; face bluntly produced downward, the sides with pale pollen and pile; thorax with black and yellow pile intermixed, the yellow predominant; bases of femora yellow becoming brownish beyond; apex of hind femur yellow; hind femur moderately swollen with spines and black bristly hairs beneath; tibiae yellowish brown, tarsi brownish; abdomen dark in ground color, clothed with reddish yellow pile; a pair of transverse pale spots on second tergite; wings subhyaline with a faint cloud in middle. Length 11.5 mm.; wing 9.5 mm.

One specimen.

*Type locality*.—Paltaybamba, 5,000 feet, Peru (August 27, 1911, Yale Peruvian Expedition).

*Type*.—Cat. No. 28788, U.S.N.M.

**Subfamily MICRODONTINAE**

The Microdontinae of the American tropics seem to have almost unlimited variation in form and color and this, combined with the large number of species occurring in this region, makes the group a very perplexing one.

There are numerous structural differences in the group, seemingly well fitted for generic uses, and at first consideration it would appear that the genus *Microdon* (to which most of the species of the subfamily belong) is a complex one that should be divided into several. The characters, however, do not lend themselves to this purpose as they do not include natural groups and frequently they appear to be of only specific importance, or are shared in common only by a few closely allied species.

One small group (about ten species) possesses a type of habitus which is so similar to the appearance of the stingless honey bees (*Trigona*) of the American tropics that they may easily be mistaken for them at first sight. But aside from the habitus, they seem to have no structural character in common by which they might be considered a distinct genus.

Walker<sup>3</sup> erected the genus *Ubristes* for one of the species which he described as *flavitibia*, and it is here proposed to use this name in the subgeneric sense for this group of species.

Subgenus UBRISTES Walker.

*Ubristes* WALKER, Insecta Saunders, Dipt. vol. 1, 1852, p. 217.

*Genotype*.—*Ubristes flavitibia* Walker.

A group remarkable for its similarity in appearance to the stingless honey bees, of the genus *Trigona*. Rather small and compact, ranging in color from entirely black to almost entirely yellow; face usually narrow; third longitudinal vein with or without an appendix; abdomen broad basally, usually contracting apically; hind legs usually hairy; eyes thinly and shortly pilose.

Walker described only the one species, *flavitibia*, although the other species here recorded (from the British Museum) were evidently before him at the time. As far as I am aware the other species are all new and are here described.

Two species, *Microdon wheeleri* Mann and *M. micromidas* Shannon described from Panama, also belong to this group.

KEY TO BRAZILIAN SPECIES OF THE SUBGENUS UBRISTES

1. Thorax and abdomen entirely black----- 2  
More or less yellow present----- 4
2. Abdomen "spindle shaped," very slightly narrowed beyond the middle;  
fairly large species, 10 mm.; legs very hairy----- *flavitibia* Walker.  
Abdomen tapering toward the apex to a blunt point; rather small  
species, 7 mm.; legs moderately hairy----- 3
3. Three visible abdominal segments; wing with preapical white stripe.  
*lacteipennis*, new species.  
Four visible segments, the fourth distinctly longer than the third; wings  
uniformly infuscated----- *trigoniformis*, new species.
4. Abdomen ovate with two pairs of large yellow spots; scutellum produced  
into a point, triangular in shape----- *scutellaris*, new species.  
Abdomen constricted behind second tergite; scutellum rounded on hind  
margin----- 5
5. Third vein with an appendix, wing uniformly infuscated.  
*fraudator*, new species.  
Third vein without an appendix, a broad, whitish preapical crossband  
on wing----- *goettei*, new species.

MICRODON (UBRISTES) LACTEIPENNIS, new species

*Male*.—A rather small, blackish species, with eyes fairly approximated above antennae; ocelli closely grouped and centrally placed upon the upper portion of front (=ocellar) triangle; first antennal joint about twice as long as broad, second equals one-half length of first, and the third is twice as long as the first; face black, narrowly yellowish on sides next to border of eyes; face narrow,

<sup>3</sup> Insecta Saunders, Dipt., vol 1, 1852, p. 217.

about three times as long as broad; eyes large, the lower margins bordering onto oral margins; dorsum of thorax smaller than head, frontal aspect; thorax black pilose; legs black, with black pile, the terminal tarsal joints all yellowish; hind tibia rather slender, with a very faint dorsal incision, moderately pilose; hind tarsus thickened; abdomen shining black with three visible segments; the third more than half the abdominal length, with the sides deflected downward so that the abdomen tapers toward the apex; hypopygium small; wings infuscated with a white crossband just beyond middle; halteres black, squamae reduced, black ciliated. Length, 6 mm.; wing, 5 mm.

Two males.

*Type locality*.—Amazon (1866, H. W. Bates).

*Type*.—In British Museum.

This species closely resembles *Trigona lacteipennis* Friese.

MICRODON (UBRISTES) TRIGONIFORMIS, new species

*Male*.—Similar to *lacteipennis*, but the first antennal joint is equal to the third; the wings are uniformly infuscated; hind tibia much larger and with a distinct dorsal incision beyond middle; four abdominal segments present, the fourth nearly as long as the basal three; angle in the apical cross vein a little more than a right angle, the distal portion directed somewhat inward; abdomen with four visible tergites, greatly narrowed behind the second segment owing to the turning downward and under of the sides of the third and fourth segments; fourth tergite as long as the combined length of the second and third (measured along median line); squamae reduced, blackish; halteres blackish. Length, 7.5 mm.; wing, 5.5 mm.

One male.

*Type locality*.—Villa Nova, Brazil (H. W. Bates).

*Type*.—In British Museum.

MICRODON (UBRISTES) GOETTEI, new species

*Female*.—General color brownish yellow with dark markings. Front a little broader than long, upper three-fourths inflated; antennae yellowish brown, slightly longer than fore tibia, first joint nearly three times as long as broad, the second about one-fourth length of first, third a little longer than combined length of first and second; arista as long as first; face nearly parallel sided, about twice as long as broad; fore and mid legs yellowish, hind legs darker, hind tibia as in *trigoniformis*; abdomen with sides behind second tergite but little turned under (probably distinctly so in the male); wings subhyaline, a broad whitish preapical band present; dorsum of thorax reddish brown, the disc blackish. Length, 9.5 mm.; wing, 7 mm.

Five females.

*Type locality*.—Amazon (H. W. Bates). Also from Ega and Para, Brazil (H. W. Bates).

*Type*.—In British Museum.

This species closely resembles *Trigona goettei* Friese.

MICRODON (UBRISTES) FRAUDATOR, new species

*Male*.—Very similar to *goettei* in coloration and to *trigoniiformis* in structure. Antennal joints 1:0.25:1; face and front broader than in *trigoniiformis*; fore and mid legs yellow, tarsal joints 1, 2, and 3 dark brown; hind femur yellowish, tibia and first three tarsal joints dark brown, dorsal incision on tibia not as pronounced as in *trigoniiformis*; abdomen as in *trigoniiformis*; wings subhyaline, no whitish stripe. Length, 8.5 mm.; wing, 6 mm.

One male.

*Type locality*.—Amazon (H. W. Bates).

*Type*.—In British Museum.

MICRODON (UBRISTES) SCUTELLARIS, new species

*Female*.—Differs considerably from the other species of this subgenus in having the abdomen broadly ovate and the scutellum produced apically and triangular in shape. Head black, front and face unusually narrow, front nearly three times as long as broad, ocellar region protuberant; antennal joints 1:0.25:1; arista shorter than third joint; face narrowed downward, pale pilose, the sides whitish pollinose; thorax dark brown, dark pilose; all the legs dark brown, the apical tarsal joints yellowish; hind femur and tibia rather slender, long dark pilose, the dorsal incision of tibia broad and rather shallow; hind metatarsus of much larger girth than either femur or tibia; abdomen brownish, the sides narrowly yellow, second and third tergites each with a large pair of yellow spots; fifth tergite well developed, yellow, with a median, longitudinal, dark stripe; wings large, slightly infuscated, with a median, rather faint, whitish cross stripe. Length 7.5 mm.; wing 8 mm.

One female.

*Type locality*.—Amazon (H. W. Bates).

*Type*.—In British Museum.

MICRODON SCOLOPUS, new species

*Male*.—This species may be readily recognized by the presence of a well developed tooth-like process at the base of each basitarsus. In general appearance similar to certain species of the subgenus *Ubristes*, but the hind legs lack the long pilosity which characterizes this group. Eye margins parallel, the front and face less than one-third the width of the head; front dark, ocellar region protuberant;

antenna reddish brown, the joints are 1:0.25:2.25, arista one-third the length of third joint; face darkened, the sides yellowish; thorax dark brown, scutellum, except base, yellowish, hind margin with an indentation; legs dark, fore and mid tarsi yellowish; abdomen broadly ovate; wings subhyaline. Length 7 mm.; wing 7 mm.

One male.

*Type locality*.—Amazon (H. W. Bates).

*Type*.—In British Museum.

**MICRODON MACULATUS, new species**

*Female*.—Medium sized, yellowish with dark thoracic and wing markings; head subhemispherical; front and face moderately narrow, yellow, with a small dark spot at ocelli; antennae inserted above the middle of head; first joint about six times as long as broad, four times longer than the second and twice as long as third; arista longer than third joint; lower margin of eye bordering onto oral margin; mesonotum yellow, maculated with dark brown, the apical half almost entirely dark brown, a pair of narrow anterior stripes and a pair of lateral spots on basal half; meso-hypoptero and metapleurae more or less darkened; scutellum small with a small emargination at middle of hind margin; four fore legs lacking; hind legs yellow, femur slender, tibia enlarged, basitarsus moderately enlarged; abdomen narrowly globose, yellow, a darkened median longitudinal stripe and an incomplete lateral one; wing rather large; subhyaline with a broad dark stripe across middle and another preapical stripe, anterior margin of wing between the dark stripes yellowish. Length 9 mm.; wing 9 mm.

One female.

*Type locality*.—Provincia Sara, Santa Cruz de la Sierra, Bolivia (February-April, 1904, J. Steinbach).

*Type*.—In British Museum.

**MICRODON NIGRISPINOSUS, new species**

*Male*.—An elongate, rather yellowish species with dark brown markings; hind femur yellow with a dense set of small black spines beneath. Ocellar region strongly protuberant, dark, front very slightly contracted above antennae; antenna dark brown, relative length of joints 1:0.25:0.75; arista two-thirds the length of third joint; face yellow, yellow pilose; mesonotum yellowish, the disk largely brownish; scutellum small with an apical pair of small spines; legs yellowish, tarsi brownish; bases of fore and mid femora on inner side with a conspicuous patch of minute reddish brown bristles; hind femur swollen, with numerous small black spines on lower side of apical two-thirds; tibia distinctly more slender than



femur; abdomen yellowish, brownish apically, elongate, second segment nearly twice as long as wide, third and fourth segments more globose; wings subhyaline; third vein with spur. Length 12 mm.; wing 10 mm.

Three males.

*Type locality*.—Ega, Brazil (H. W. Bates). Also Tapayos, Brazil (H. W. Bates).

*Type*.—In British Museum.

MICRODON BATESI, new species

*Female*.—Very close to *Microdon nigrispinosus*, differs as follows: Front entirely dark; antennae more elongate, the joints being 1:0.25:1; base of first joint yellowish; face somewhat broader, more protuberant below; thorax darkened, humeri yellowish; scutellum with a purplish reflection and without spines; hind femur with comparatively few black spines beneath; abdomen clavate, second segment nearly four times as long as broad, remaining part of abdomen somewhat globose, dark brown, hind margin of third tergite yellow; wings subhyaline, infuscated along third vein. Length 13 mm.; wing 10 mm.

One female.

*Type locality*.—Amazon, Brazil (H. W. Bates).

*Type*.—In British Museum.

This specimen bears the label "A very interesting new genus. S. W. W."-[S. W. Williston]. As it does not differ from the genus *Microdon* in any other respect, and as a constricted abdomen is possessed by other species of *Microdon*, the species had best remain in this genus.

NOTES AND DESCRIPTIONS OF SPECIES FROM CHILE

The Diptera of Chile were given considerable attention from 1834 to 1888 by a number of the foremost dipterologists of that period. Chief among them were Macquart, who described a large number of new species in his four volumes of the *Diptera Exotica*; Blanchard, who contributed the section on Diptera for the *Gay Historia de Chile, Zoologia*<sup>4</sup>; R. A. Philippi, who published the *Aufzählung der Chilenischen Diptera*<sup>5</sup>; and finally E. C. Reed, who published the *Catalogo de los Insectos Dipteres de Chile*.<sup>6</sup>

Several other dipterists, Wiedemann, Schiner, Van der Wulp, Bigot, and Lynch-Arribalzaga, made minor or incidental contributions during this same period.

<sup>4</sup> Vol. 7, 1852, pp. 327-468.

<sup>5</sup> Verhandlungen der Zoologisch-Botanischen Gesellschaft, Wien, vol. 15, 1865, pp. 595-782.

<sup>6</sup> Anales de la Universidad de Chile, Santiago, vol. 73, 1888, pp. 271-316.

Very little has been written on the Chilean Diptera since that time and until recently (as far as the writer is aware) very little collecting has been done.

During the past few years Señor A. Faz has been making a study of the Diptera of this region and has sent material to the United States National Museum for identification. This material, supplemented by a small collection received years ago from Reed, as well as a small lot of specimens loaned by the British Museum and a few specimens from other sources, is the basis for the present small contribution to the Chilean Syrphidae and also for part of another paper, by the writer on the American Xylotini, which has been recently published.<sup>7</sup>

Dr. J. M. Aldrich has attempted to learn the condition of the collection which was used by Philippi as the basis for his publication but with negative results.

#### MELANOSTOMA FENESTRATUM (Macquart)

*Syrphus fenestratum* MACQUART, Dipt. Exot., vol. 2, 1842, p. 103.

*Melanostoma punctulatum* V. d. WULF, Tijdschr. v. Entomol., vol. 31, 1888, p. 375.

*Male and female.*—This species has been considered a synonym of *stegnum* Say. They are very closely allied but certain differences are present which serve to distinguish them as two species.

The male of *fenestratum* has smaller and entirely black antennae: the face widens downward; the legs darker; the aeneous spots on the fourth segment less than a third the length of the segment and isolated. In *stegnum* the third joint is reddish brown, the face parallel sided and the aeneous spots on the fourth tergite occupy half of the segment and are connected together and to the aeneous hind margin of the segment by a longitudinal aeneous stripe.

In the female *stegnum* the front is broader and the antennae more brightly colored than in *fenestratum* and the aeneous markings on the fourth segment are, in each case, in agreement with those found in their respective males.

One male, five females.

Chile: Santiago, October 9, 1921, (A. Faz); Angol, May 23, 1925.

#### Genus MESOGRAMMA Loew

*Mesogramma* LOEW, Berlin Ent. Zeitschr., vol. 9, 1865, p. 157.

Only two species of this genus, hitherto considered under the genus *Syrphus*, are known from Chile.

<sup>7</sup> Proc. U. S. Nat. Mus., vol. 69, no. 2635, 1926, pp. 1-52.

**MESOGRAMMA PHILIPPI, new name**

*Syrphus interruptus* PHILIPPI, Verh. Zool.-bot. Ges. Wien., vol. 15, 1865, p. 747. (Name preoccupied by *Syrphus interruptus* Gmelin, 1792).

*Male*.—A species easily recognized, within the genus, by its peculiar abdominal yellow markings. The usual transverse yellow bands are reduced to a pair of submedian yellow spots on each segment which may be joined by slender connections to the yellow lateral abdominal margins.

One specimen.

Perales, Chile, September 23 (A. Faz).

**MESOGRAMMA CALCEOLATUS (Macquart)**

*Syrphus calceolatus* MACQUART, Dipt. Exot., vol. 2, 1842, p. 9.

The yellow crossbands extend completely across tergites two, three, four, and five and join the yellow lateral margins of the abdomen.

One male, five females.

Santiago, Chile, 1924 (A. Faz).

**Genus ALLOGRAPTA Osten Sacken**

*Allograpta* OSTEN SACKEN, Bull. Buffalo Soc. Nat. Hist., vol. 3, 1876, p. 49.

Two species are at hand which belong to the difficult *Mesogramma-Allograpta-Sphaerophoria* group, in which the generic limits are very poorly defined. The species at hand are apparently more closely related to the genotype of *Allograpta*, *obliqua* Say, than to the genotypes of the other two genera and are therefore here considered under *Allograpta*. In fact F. Lynch-Arribalzaga has already placed one of them in this genus.

**ALLOGRAPTA HORTENSIS (Philippi)**

*Syrphus hortiensis* PHILIPPI, Verh. Zool.-bot. Ges. Wien, vol. 15, 1865, p. 746.

A female specimen at hand agrees very satisfactorily with Philippi's description. A shining bronzy black stripe of uniform width extends from the anterior oral margin upwards through the base of the antenna and clear to the vertex, where it widens out and joins the eye margins; jowl yellow with a black spot extending from the middle of the oral margin to the eye; mesonotum bronzy black, a yellow stripe on the side extending from the anterior corner to the root of the wing; post alar callus and scutellum yellow; meso- and sternopleurae with a yellow spot; metapleura very obscurely yellow; legs mostly yellow, the tarsi, apical half of hind femur, and hind tibia brownish, a pale ring at the middle of the tibia; apical corners of abdomen yellow; a broadly interrupted yellow crossband midway of the second tergite, which is parallel to the fore and hind margins of the tergite; third, fourth, and fifth tergites each with a pair of

oblique yellow spots directed outward and backwards. Length 7 mm.; wing 5 mm.

Chile: Santiago (A. Faz).

**ALLOGRAPTA PULCHRA, new species**

*Female*.—This species is easily separated from *hortensis* by the much less developed stripe extending from the anterior oral margin to the vertex; it is suddenly narrowed at the antenna, being less than one-half the width below the antenna than above; no black spot on jowl; metapleura (pleurotergite) extensively yellow; the yellow markings on the abdomen much larger, the spots on the second tergite usually narrowly confluent; those on the third tergite connected and forming a broad cross band which extends over the sides; the fourth and fifth tergites each with a pair of oblique spots which extend over the sides. Length 6.5 mm.; wing 5 mm.

*Male*.—Ocellar triangle aeneous black; frontal triangle entirely yellow; facial stripe narrow, sometimes greatly reduced; upper eye facets moderately enlarged.

Eight males, seven females.

*Type locality*.—Anglo, Chile (February 21, 1924, D. S. Bullock).

*Type*.—Male, Cat. No. 28745, U.S.N.M.

A male and female (Chile, E. C. Reed) were determined by Reed as *hortensis*.

**FAZIA, new genus**

*Type*.—*Fazia bullaephora*, new species.

Belongs to the tribe Syrphini. Differs from *Syrphus ribesii* Linnaeus (which is considered typical of the genus *Syrphus*) in having the oral margin anteriorly produced (figs. 7 and 8); the apical cross-vein rather strongly recurrent (figs. 9 and 10); and the metasternum pilose. This last character is found in only two other genera of the Syrphinae (as far as I know), namely, *Asarina*, found in the Orient, and *Claraplumula*. *Asarina* is quite distinct from *Fazia*. *Claraplumula* is described in the preceding section of this paper.

The antennae are widely separated in *Fazia*, the lower squama is bare, and the sides of the abdomen are not margined.

The genus is named for Sr. A. Faz, of Chile.

**FAZIA BULLAEPHORA, new species**

*Female*.—Upper half of front including vertex dark aeneous, lower half, save for a well-defined black region above antennae, yellow; entire front black pilose, width at vertex not as wide as the distance between the lateral margins of the antennal pits; antennal pits separated, antennae rather small, black; arista black, as long as length of antenna; face yellow, yellowish brown through the middle; tubercle prominent; oral margin produced in front and darkened;

on each side of the face is an inflated area, or bulla; mesonotum dark aeneous, the notoplural calli, the post alar calli and scutellum yellowish; legs, including bases of femora, yellowish brown, the tarsi darker; anterior corners of first tergite yellow; second, third, fourth, and fifth tergites each with a pair of conspicuous, large reddish yellow spots, not confluent with the lateral abdominal margins; sides of sixth tergite yellowish; dorsal addominal pile mostly black; venter yellowish with mostly pale pile; wings slightly infuscated. Length 11.5 mm.; wing 9.5 mm.

Seven females.

*Type locality*.—Chile (1922, A. Faz).

*Type*.—Cat. No. 28746, U.S.N.M.

Two specimens, labeled Chile, 1922, A. Faz, were determined as *Syrphus decemmaculata* Rondani (Aldrich); two having puparia mounted on the same pins and labeled Southern Chile, on *Lobelia constitucim* M. J. Rivera, were determined as *Syrphus sexmaculata* Macquart (Coquillett); two labeled Chile, E. C. Reed, also determined as *sexmaculata* (Reed); and one, labeled Chile, E. C. Reed, was determined as *Syrphus gayi* Blanchard (Reed).

The descriptions of these three species above mentioned all differ to some extent from the specimens before me and until the types have been examined, the best course to follow is to consider the present specimens as a new species and give it a definite name. Especially should this be the case as the following species is a very close ally to the present one.

#### FAZIA AUSTRALIS, new species

*Male and female*.—Differs from *bullaephora* in being somewhat smaller; the front of the female proportionately broader, being wider at the vertex than the width between the outside margins of the antennal pits; and more extensively yellow, no yellow mark above antennae; antennae smaller, the basal joints and arista reddish yellow, third joint brownish; face without a bulla on each side, distinctly more protruding, the lower margin of the head of greater length than the height (shorter in *bullaephora*); sides of mesonotum almost continuously yellow; scutellum yellow; legs yellowish, the tarsi darker; number and arrangement of the abdominal spots similar but spots somewhat larger; the abdomen more narrow. Length 10 mm.; wing 8.5 mm.

*Type locality*.—Chile (E. C. Reed).

*Type*.—Cat. No. 28747, U.S.N.M.

One male, type; one female, allotype.

These specimens were determined by Reed as *Syrphus similis* Blanchard. *S. similis* is far more likely to be allied to the species described below as *Syrphus reedii* than to *australis*.

## SYRPHUS GAYI Macquart

*Syrphus gayi* MACQUART, Dipt. Exot., vol. 2, pt. 2, 1842, p. 90.

One male and three females (determined by Aldrich as this species) agree so closely with the description of *S. gayi* that it seems best to let them stand under this name. The only discrepancy between the specimens and the description lies in the color of the last abdominal segment. The description states that the last segment is black with the hind border yellow. In the present specimens the anterior corners of this segment are broadly yellow, this color continuing along the side margins to the hind margin, which is mainly black.

*Male and female.*—Front, both sexes, black aeneous; third antennal joint black; legs yellow, bases of femora black, the tarsi brownish; second, third, and fourth tergites each with a pair of very large, reddish yellow spots which extend over the sides of the abdomen; lower squamae pilose. This last character allies the species to the *ribesii* group of the genus *Syrphus*.

Four specimens, Santiago, Chile (A. Faz).

## SYRPHUS REEDI, new species

*Male and female.*—Lower squamae pilose, therefore allied to the *ribesii* group. Ocellar triangle of male and vertex of female dark aeneous, the front light aeneous, with black pile; antenna moderate, reddish yellow below, brownish above; arista reddish brown; in the female the third joint is one and one-half times the width of the front across ocelli; face yellow, mostly pale pilose, the tubercle moderate, jowls also yellow; mesonotum greenish aeneous, the sides somewhat yellowish with yellow pile; legs yellow, the extreme bases of the femora dark brown to black; hind tarsi a little brownish; second tergite with a pair of large yellow spots which extend forward along the sides to the anterior corners of the first tergite; third and fourth tergites each with an anterior yellow transverse stripe which extends over the sides of the abdomen in their full width; hind margins of the fourth and fifth tergites yellowish; wings slightly infuscated, more so anteriorly. Length 12 mm.; wing 11 mm.

This species resembles *S. ribesii* very closely. The antennae are distinctly smaller in *ribesii*, the femora of this species are more extensively black basally, in the male the hind femur is black on the basal half and the female has a median dark ring at the middle. Also the yellow stripes on the third and fourth tergites in *ribesii* are broader.

This species, *reedi*, may eventually prove to be *Syrphus similis* Blanchard, which is said to resemble *S. ribesii*. However, the de-

scription of *similis* states that the fourth and fifth abdominal segments are yellow. Immature specimens before me have these segments a diffuse yellowish brown, but well-colored specimens have the yellow stripes in strong contrast to the black of the rest of the tergites. Seven males, nine females.

*Type locality*.—Valparaiso, Chile (A. Faz).

*Type*.—Male, Cat. No. 28748, U.S.N.M.

#### Genus SCAEVA Fabricius

*Scaeva* FABRICIUS, Systema Antliat., 1805, p. 248.

*Lasiophticus* RONDANI, Nouv. Annal. Sci. Nat. Bologna, ser. 2, vol. 2, 1844, p. 459.

*Catabomba* OSTEN SACKEN, Bull. U. S. Geol. Surv., vol. 3, 1877, p. 325.

This genus, also widely known under the name of *Catabomba* and *Lasiophticus*, is represented in Chile by two species.

It appears quite certain that one of them is the same species as that described by Macquart under the name *Syrphus melanostoma*, especially as it is stated in the Fauna Chilena<sup>3</sup> to resemble *S. pyrastris* of Europe, differing by its more narrow form and the abdominal spots being less broad.

#### SCAEVA MELANOSTOMA (Macquart)

*Syrphus melanostomus* MACQUART, Dipt. Exot., vol 2, pt. 2, 1842, p. 87.

*Syrphus latifacies* MACQUART, Dipt. Exot., suppl. 4, 1849, p. 152.

*Syrphus seaguttatus* V. D. WULP, Tijdschr., v. Entomol., vol. 25, 1882, p. 135.

*Male and female*.—Eyes hairy; front and face very broad, inflated; ocellar triangle of male black aeneous and black pilose, the three sides equal in length; the frontal triangle as broad as the face, rather densely black pilose; in female the width of front across ocelli is greater than length of arista, the lower portion of the front as broad as the face; the front yellowish except for a shining black band extending between the eyes across the ocelli; antennae and arista dark brown, length of arista a little shorter than antenna; face moderately protruding below, the tubercle prominent and the anterior oral margin slightly projecting; face largely yellow, the jowls and the oral margin shining black, the tubercle brownish; a loose row of blackish hairs extending from base of antenna down close to the side of the face, remainder of pile pale and inconspicuous; mesonotum and disk of scutellum greenish aeneous, somewhat yellowish around the side and hind margins; clothed with pale loose pile; bases of fore and mid femora, all but the apex of hind femora, and the tarsi black, remainder of femora and tibiae yellowish; abdomen black, the second, third, and fourth tergites each

<sup>3</sup> Vol. 7, 1856, p. 410.

with a pair of yellow lunules which do not extend to the sides of the abdomen; hind margins of fourth and fifth tergites yellow, the fifth with a pair of small yellowish spots on anterior margin; wings glassy, almost entirely devoid of villosity; squamae whitish, disk of lower one bare. Length 13 mm.; wing 11 mm.

*S. pyrastris* differs in having the abdomen broader, and the abdominal spots larger and more arcuate.

The description of *melanostoma* states that the sides of the thorax are yellow. In the present species the sides are faintly yellow; otherwise the description fits the species before me.

Three males, eight females. Santiago, October 9, 1921 (A. Faz).

Chile: Santiago, Valparaiso (A. Faz).

Maipu, February 20, 1906 (F. V. Ibarro).

Southern Chile (M. J. Rivera).

Locality? (E. C. Reed).

#### SCAEVA OCCIDENTALIS, new species

*Female*.—Closely allied to *melanostoma*, but differs in having the front and face narrower; facial pile entirely pale; scutellum entirely yellowish; hind femur less extensively black, almost half of the apical half yellowish; tarsi more yellowish; the yellow abdominal spots distinctly larger and less arcuate, the black separating the spots in each pair narrower than the length of (front to back) the spots (in *melanostoma* the black separating the spots much broader than the length of the spots). Length 13 mm.; wing 10 mm.

This species can hardly be that described as *melanostoma* by Macquart, as the yellow abdominal spots are distinctly larger and more rotund than in *pyrastris*.

One specimen.

*Type locality*.—Santiago, Chile (A. Faz).

*Type*.—Cat. No. 28749, U.S.N.M.

#### Genus BACCHA Fabricius

*Baccha* FABRICIUS, Syst. Antliat., 1805, p. 199.

Six species of *Baccha* have been described from Chile. Three species are at hand, only one of which can be definitely connected with one of the six already described.

#### KEY TO THE CHILEAN SPECIES OF BACCHA AT HAND

1. Alula well developed; metasternum girdled with chitin; wings hyaline with a distinct spot.....*conopida* Philippi.
- Alula absent; metasternum membranous behind; wings smoky..... 2
2. Lower margin of eye contiguous with oral margin; mesonotum entirely aeneous.....*filiola*, new species.
- Lower margin of eye distinctly separated from oral margin; anterior lateral mesonotal margin yellow.....*felix*, new species.



## BACCHA CONOPIDA Philippi

*Baccha conopida* PHILIPPI, Verh. Zool.-bot. Ges. Wien, vol. 15, 1865, p. 750.

A species easily recognized by the brownish front and face bordered by a narrow yellow margin; the abbreviated yellow stripes at the anterior corners of the mesonotum; the yellow scutellum and the hyaline wings with a brown spot at the middle of the anterior margin.

Three males, one female.

Chile (E. C. Reed); Southern Chile (M. J. Rivera); Santiago, Chile (A. Faz); Valparaiso (A. Faz).

## BACCHA FILIOLA, new species

*Male*.—Agrees with Philippi's description of *valdiviana*, except that this species is said to have the wing hyaline with three spots, while the present species has the wings entirely smoky and no spots. Frons black aeneous, very narrow; frontal triangle black aeneous, rugose; frontal lunule yellow with a central black spot above antennae; antennae small, brownish; face very narrow, the sides gently converging downward; lower eye margin bordering onto oral margin; thorax entirely dark aeneous, a pair of faint longitudinal pollinose stripes on mesonotum; pleurae with a faint reddish yellow tinge; legs yellowish brown, hind legs darker; abdomen extremely narrow at second and third tergites; tergites two and three each with two pairs of yellowish spots, the fourth with one pair; wings entirely smoky, unusually small, the discal crossvein nearly at middle of discal cell; alula and basal portion of axillary cell vestigial. Length 9 mm.; wing 5.5 mm.

Two males.

*Type locality*.—Valparaiso, Chile (A. Faz); also from Santiago, Chile (A. Faz).

*Type*.—Cat. No. 28751, U.S.N.M.

## BACCHA FELIX, new species

The vestigial alula as well as the basal portion of the axillary cell allies this species to *filiola*. They are easily differentiated, *felix* is much larger, the antennae larger and more yellow; the face broadly yellow on the sides and below; the lower eye margin well separated from the oral margin; humeral and notopleura yellow; hind margin of scutellum yellow; pleurae largely yellow; fore and mid legs yellowish brown; hind legs dark brown; abdomen dark aeneous, side margins of first tergite and the anterior two-thirds of the second yellow; anterior corners of the third and fourth tergites yellow;

discal cross vein well before middle of discal cell; wings entirely smoky. Length 11 mm.; wing 9 mm.

Two males, one female.

*Type locality*.—Valparaiso, Chile (A. Faz); also from Santiago, Chile (A. Faz).

*Type*.—Male. Cat. No. 28750, U.S.N.M.

#### PENIUM TRISTE Philippi

*Penium triste* PHILIPPI, Verh. Zool.-bot. Ges. Wien, vol. 15, 1865, p. 741.

The species described by Bigot as *Chilosia aurantipes*, from Chile, may prove to be this species.

*Male*.—Entirely black; eyes hairy; face pilose, pale and black mixed; femora black; tibiae reddish yellow basally and apically, broadly black at the middle; fore and mid tarsi reddish brown; hind tarsi reddish yellow, becoming brown apically.

Originally described from Chile. One male at hand, Santiago, Chile (A. Faz).

#### VALDIVIA, new genus

Three specimens, two males and one female, representing three species are at hand which appear to belong to the same, evidently new, genus. All three are from Chile. A species described by Philippi as *Ocyptamus valdivianus* from the province of Valdivia may also belong to this genus.

*Description of the genus*.—Fairly large, elongate flies, related more or less to the tribe Sphegini of the Chilosinae. The males are dichoptic, the face is tuberculate and the abdomen is constricted basally. The female has the face concave and the abdomen of nearly uniform width, there being a slight, progressive narrowing towards the base. In both sexes the face is not pilose; the palpi are unusually long and slender; the venation is quite similar to the Chilosine type, except that the apical cross vein is twice angled; the alula is as broad as the second basal cell; the anal furrow is considerably reduced; the metasternum is bare and may be completely girdled with chitin or membranous behind.

*Genotype*.—*Valdivia darwini*, new species.

Named in commemoration of Pedro de Valdivia, the early Spanish explorer of Chile.

#### KEY TO SPECIES OF VALDIVIA

A<sup>1</sup>. All the femora, tibiae, and tarsi entirely reddish yellow.

*darwini*, new species.

A<sup>2</sup>. All the femora and tibiae extensively black.

B<sup>1</sup>. Abdomen black.....*nigra*, new species.

B<sup>2</sup>. Abdomen reddish.....*ruficauda*, new species.

## VOLDIVIA DARWINI, new species

A species easily recognized by its reddish yellow legs; sides of mesonotum with a distinct gray pollinose border; strongly constricted abdomen; metasternum completely girdled with chitin and a rather small dark spot at the base of the subcostal cell.

*Male*.—Eyes fairly approximated, separated by a width equal to length of first antennal joint; antennae dark brown; third joint suborbicular; arista somewhat longer than length of antennae; face broadly covered with dense, yellowish pollen; tubercle moderate; mesonotum black, bordered on the sides and behind by a dense grayish pollinose stripe; scutellum black; legs, except coxae and trochanters, reddish yellow; metasternum bare, girdled with chitin; hind femur with numerous black spines beneath; abdomen brownish, the extreme hind borders of second, third, and fourth tergites pale yellow; second segment rather elongated and strongly constricted on its basal two-thirds; hypopygium moderate; wings mostly hyaline, a dark spot at the base of subcostal cell, remainder of cell yellowish; a rather faint preapical cloud on anterior half of wing; squamae yellowish. Length 12.5 mm.; wing 9 mm.

*Type locality*.—Valdivia, Chile (Patagonia).

One specimen, collected by Charles Darwin.

*Type*.—In the British Museum of Natural History. Named for the illustrious naturalist, Charles Darwin, who collected the species while on the famous voyage of the *Beagle*.

## VALDIVIA NIGRA, new species

*Male*.—Differs from *darwinii* as follows: The eyes are somewhat more widely separated; the antennae black, the third joint distinctly larger and broader than long; arista black and distinctly heavier; face deeply concave below antennae, the tubercle more prominent; mesonotum with a very faint trace of pollen around the borders; legs black save for the yellow apices of femora, bases and apices of tibiae and most of the tarsi; metasternum membranous behind; abdomen black, more elongate and less constricted, the second segment not broadened behind; hypopygium greatly enlarged and protruding; stigma entirely black. Length 15 mm.; wing 10.5 mm.

*Type locality*.—Santiago, Chile (1924, A. Faz).

*Type*.—Cat. No. 28752, U.S.N.M.

## VALDIVIA RUFICAUDA, new species

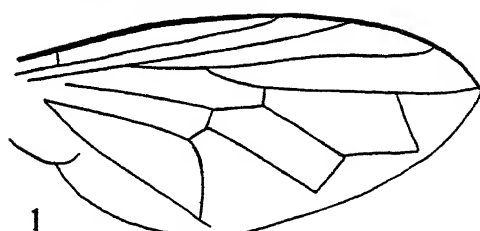
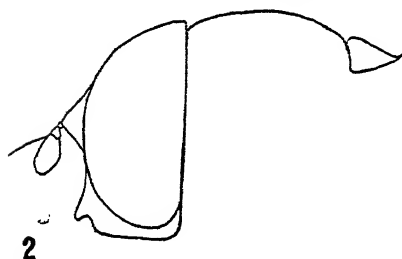
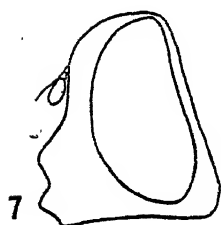
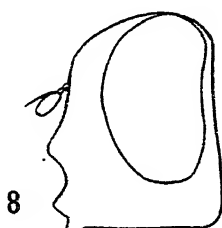
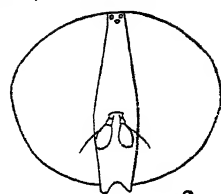
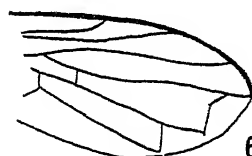
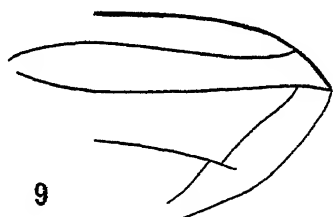
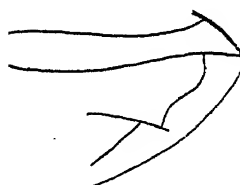
*Female*.—Very close to *V. nigra*; in fact, it may prove to be the female of that species, but, because the differences are so striking, it appears to be the better plan to describe it under another name.

Antennae black, the third joint smaller and the arista less stout (normal type) than in *nigra*. Face rather deeply concave, the epistoma projecting a little beyond the antennal prominence; legs more brownish than in *nigra*, the torsi more extensively yellowish; abdomen entirely reddish yellow, not constricted basally, but progressively narrowed toward the base; wings as in *nigra*. Length 11.5 mm.; wing 9 mm.

*Type locality*.—Santiago, Chile (1924, A. Faz).

*Type*.—Cat. No. 28753, U. S. N. M.



*Alipumilio femoratus**Alipumilio femoratus**Fazia australis**Fazia bullaephora**Alipumilio femoratus**Allograpta piurana**Calostigma elnora**Halictomyia boliviensis**Syrphus ribesii**Fazia bullaephora*

FIGS. 1-10.—1, WING OF ALIPUMILIO FEMORATUS. 2, HEAD AND THORACIC DORSUM OF SAME. 3, HEAD OF SAME, FRONTAL VIEW. 4, ABDOMEN OF ALLOGRAPTA PIURANA. 5, WING OF CALOSTIGMA ELNORA. 6, WING OF HALICTOMYIA BOLIVIENSIS. 7, SIDE VIEW OF HEAD OF FAZIA AUSTRALIS. 8, SIDE VIEW OF HEAD OF FAZIA BULLAEPHORA. 9, APEX OF WING OF SYRPHUS RIBESII. 10, APEX OF WING OF FAZIA BULLAEPHORA.



# ON A COLLECTION OF COPEPODA FROM FLORIDA, WITH A DESCRIPTION OF DIAPTOMUS FLORIDANUS, NEW SPECIES

By C. DWIGHT MARSH

*Of the United States Department of Agriculture*

Among collections made by F. J. Myers in Polk County, Fla., in 1918 and given me by H. K. Harring were three vials, numbered 1, 3, and 4, containing copepods. The following species were represented:

*Diaptomus floridanus*, new species.

*Cyclops viridis* Jurine.

*Cyclops leuckarti* Claus.

*Cyclops albidus* Jurine.

*Cyclops fuscus* Jurine.

*Cyclops serrulatus* Fischer.

*Cyclops phaleratus* Koch.

*Canthocamptus northumbicus* Brady.

Other than the discovery of an hitherto undescribed species of *Diaptomus*, which here is given the name *floridanus*, no especial importance attaches to the occurrence of *Canthocamptus northumbicus* or the species of *Cyclops*, with the exception of *Cyclops viridis*, as they are forms which are practically world-wide in distribution.

The presence of *Cyclops viridis*, however, is of considerable interest. While this species has been reported from many American localities, the evidence of the distribution of the true European *viridis* in America is very meager, and many of the identifications are very doubtful.

Chambers<sup>1</sup> states clearly the distinctive characteristics of *C. viridis* Jurine, *C. parvus* Herrick, and *C. americanus* Marsh. Marsh<sup>2</sup> verifying Chambers's findings, not only has reexamined and compared these three species, but also *Cyclops brevispinosus* Herrick and *Cyclops magnus* Marsh.

<sup>1</sup> Chambers, Robert, jr. A discussion of *Cyclops viridis* Jurine. Biol. Bull. 22, pp. 291-296, 1912.

<sup>2</sup> Marsh, C. Dwight. Rep. Can. Arc. Exped., vol. 7. Crustacea, Part J. Freshwater Copepoda, pp. 3 J-25 J, 1920.



In both papers the characteristics of the European *viridis* are stated as being the concave anterior margin of the receptaculum seminis, the ciliated furca, the lack of joint in the spine of the terminal segment of the fifth foot, and the spinal formula for the terminal segment of the swimming feet, 2, 3, 3, 3. Apparently authentic collections of this form in America are very few. As mentioned by Marsh in the paper of the Canadian Arctic Expedition, the only certain identifications are of a collection from Edgewater, N. J., by Chambers, one from Green Bay, Wis., by Marsh, and this collection made by Myers in Florida. Presumably the species is found at least in the intervening regions, but it appears to be somewhat rare.

**DIAPTOMUS FLORIDANUS, new species**

A small form. The last cephalothoracic segment is somewhat expanded laterally and each side bears two pronounced spines (fig. 1). The fifth segment of the female bears a blunt spine, projecting backward, on the dorsal side (fig. 2).

The first segment of the female abdomen (fig. 3) much exceeds in length the rest of the abdomen. It is much dilated in front and moderately so laterally. It bears on each side, well forward, a rather large acute spine. The second segment is very short and is nearly or quite covered by the overlapping posterior margin of the first segment. The third segment and the furca are nearly equal in length. The branches of the furca are ciliated on both interior and exterior margins.

The antennae reach beyond the furca. The right antenna of the male is much swollen anterior to the geniculating joint; the antepenultimate segment bears a stout recurved hook which is about one-half the length of the penultimate segment (fig. 4).

In the fifth feet of the female (fig. 5) the spines of the first basal segments are prominent and acute. The lateral hairs of the second basal segments are slender. The length of the first segment of the exopodite is more than twice its width. The second segment of the exopodite is a rather stout hook, of slight curvature, and is denticulate on both margins. The third segment is distinct and armed with two spines, the inner being long and slender. The endopodite is one segmented, shorter than the first segment of the exopodite, and with the tip armed with two slender spines. The tip is setose.

The basal segments of the male fifth feet (fig. 6) are armed with the customary spines which are rather prominent and acute. The second basal segment of the right foot is slightly longer than wide and has the lateral hair near the distal end of the segment. The first segment of the exopodite is short, its length being about two-thirds of its width. The second segment is nearly quadrangular in

outline and longer than wide. The lateral spine springs from the outer distal angle, is straight, and equals in length the two segments of the exopodite. The terminal hook rises from the inner distal angle, is sharply curved, the two parts being nearly at right angles with each other, and exceeds in length the whole right foot. There

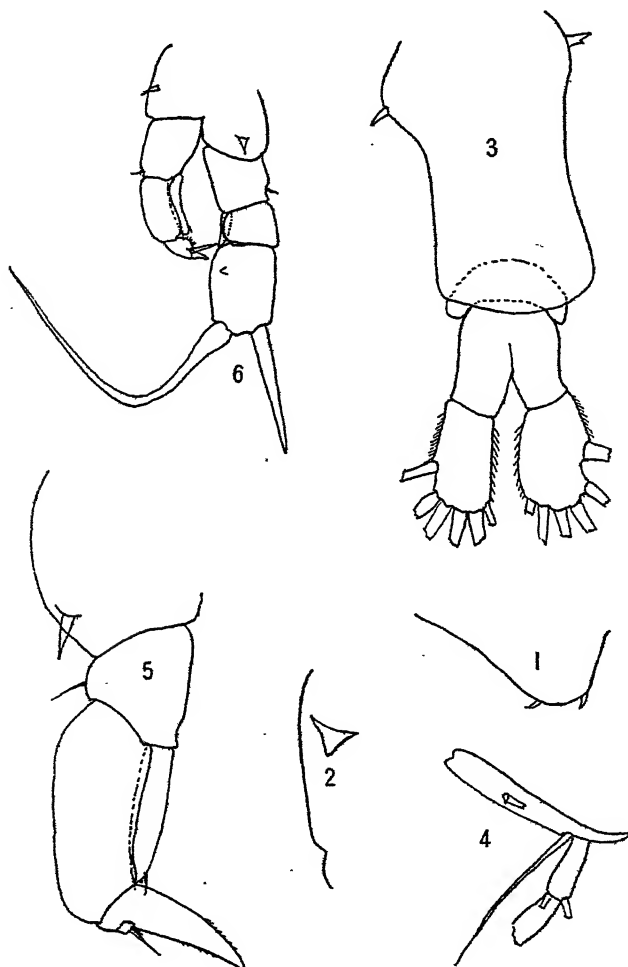


FIG. 1-6.—1, RIGHT WING OF LAST CEPHALOTHORACIC SEGMENT,  $\times 223$ . 2, PROFILE OF FIFTH SEGMENT OF FEMALE TO SHOW DORSAL SPINE,  $\times 223$ . 3, ABDOMEN OF FEMALE,  $\times 223$ . 4, TERMINAL SEGMENTS OF RIGHT MALE ANTENNA,  $\times 223$ . 5, FIFTH FOOT OF FEMALE,  $\times 438$ . 6, FIFTH FOOT OF MALE,  $\times 223$ .

is a small blunt spine on the posterior surface of the second segment of the exopodite, situated on the inner margin at about one-third of its length. The right endopodite is one segmented and equal in length to the first segment of the exopodite. The left foot reaches

to about the middle of the second segment of the right exopodite. The second basal segment is of about the same length as the corresponding segment of the right foot and has the lateral hair near the distal end. The first segment of the exopodite is twice as long as wide. The second segment is short, setose on the inner margin, and armed with a digitiform process and a sharp spine. The endopodite is slender, as long as the first segment of the exopodite, and setose at tip.

Length of female, 1.1 mm. Length of male, 0.9 mm.

*Locality*.—Ponds in Polk County, Fla., in collections made by Frank J. Myers.

This species resembles *D. saltillinus* Brewer so closely that it is, perhaps, a fair question whether it should be considered more than a variety of that species. It has been considered best, however, to recognize it as distinct. It differs from *D. saltillinus* in the following particulars;

In the male fifth feet there is no projection on the inner margin of the second basal segment of the right foot. There is a small blunt spine on the posterior surface of the second segment of the right exopodite.

In the female abdomen the second segment is covered or nearly covered by the first, while in *D. saltillinus* this segment is distinct. Schacht, 1897,<sup>3</sup> describes *D. albuquerquensis* from Florida. It was shown by Marsh, 1907,<sup>4</sup> that his description did not apply to *D. albuquerquensis* Herrick and the suggestion was made that it was more nearly like *D. saltillinus*. It seems probable, now, that his *D. albuquerquensis* was *D. floridanus*.

Paratype of male deposited in National Museum, slide, Cat. No. 52397, U.S.N.M.

Paratype of female deposited in National Museum, slide, Cat. No. 52398, U.S.N.M.

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<sup>3</sup> Bull. Ill. State Lab. Nat. Hist., vol. 5, art. 3, The North American Species of Diaptomus, pp. 146-149.

<sup>4</sup> Trans. Wis. Acad. Sciences, Arts and Letters, vol. 15, pt. 2, A Revision of the North American Species of Diaptomus, pp. 473-474.

## NEW WEST AMERICAN MARINE MOLLUSKS

By PAUL BARTSCH

*Curator of Mollusks, United States National Museum*

Among the many lots of minute marine mollusks sent to the United States National Museum for determination from time to time, there have been found quite a number of new species which are here described. Brief descriptions of a few of these, but not figures, have been published in the Journal of the Washington Academy of Sciences and in the Proceedings of the Biological Society of Washington, as cited under these species.

We are much indebted for this additional knowledge of new west American species, as well as for much additional information on species previously described, to a number of ardent collectors of mollusks.

The greatest number of those here described were collected by Dr. R. H. Tremper, who secured no less than seven undescribed species in a visit to San Clemente Island, as follows:

*Astyris clementensis.*

*Opalia tremperi.*

*Aclis californica.*

*Odostomia (Chrysallida) tremperi.*

*Odostomia (Chrysallida) clementensis.*

*Odostomia (Evalea) bachia.*

*?Rissoella californica.*

He also discovered *Turbonilla (Mormula) enna* and *Odostomia (Salassia) oena* off Dead Mans Island, California.

An exceedingly interesting sending came from Mr. Walter J. Eyerdam, whose material was collected in Shuyak Strait, Afognak Island, Alaska. From this sending I describe:

*Turbonilla (Pyrgolampros) stelleri.*

*Turbonilla (Pyrgolampros) shuyakensis.*

*Turbonilla (Pyrgolampros) middendorffi.*

*Turbonilla (Pyrgolampros) eyerdami.*

*Odostomia (Evalea) eyerdami.*

*Alvania dalli.*

Dr. I. S. Oldroyd, as usual, has contributed a large part of the species here described:

*Melanella* (*Melanella*) *portlandica* from Portland, Oregon.

*Odostomia* (*Chrysallida*) *cumshewaensis* from Cumshewa Inlet.

*Cerithiopsis* (*Cerithiopsidella*) *fla* from Monterey, California.

*Vitrinella* (*Docomphala*) *columbiana* from Departure Bay.

Dr. Carl C. Engberg's careful collecting about Friday Harbor, San Juan Island, and Olga, Washington, has brought to light large series of previously rare species as well as a large number of new species. They are:

*Odostomia* (*Amaura*) *sanjuanensis*.

*Odostomia* (*Amaura*) *washingtona*.

*Alvania* *sanjuanensis*.

To Mr. A. G. Smith we owe the discovery of—

*Turbonilla* (*Pyrgolampros*) *ilfa* at San Pedro.

*Turbonilla* (*Pyrgiscus*) *delmontensis* at Del Monte.

*Margarites* (? *Lirularia*) *smithi* at Monterey.

*Vitrinella* *smithi* at Whites Point.

A. M. Strong and C. E. White have, through their careful study of the habitats occupied by mollusks, made some splendid contributions to molluscan ecology in an old territory. Their work shows plainly that most of the fascinating field studies of mollusks and their adjustments to suitable habitats have scarcely been touched. We hope sincerely that they may continue their researches in this much-neglected field. To them we owe the discovery of—

*Odostomia* (*Chrysallida*) *catalinensis* at Catalina Island.

*Odostomia* (*Evalea*) *strongi* at Catalina Island.

*Odostomia* (*Evalea*) *whitei* at Point Firmin.

Our indefatigable friend Mr. C. R. Orcutt has added:

*Turbonilla* (*Ptycheulimella*) *magdalenensis* and

*Odostomia* (*Chrysallida*) *era* from Magdalena Bay.

*Odostomia* (*Chrysallida*) *fla* from Todos Santos, Lower California.

To each of the following we are indebted for a new species: Mrs. Carrie L. Simons, *Amphithalamus stephensae* from Magdalena Bay, Lower California; Mr. E. P. Chace, *Odostomia* (*Chrysallida*) *chacei* from off Cayucas, California; and the late Mr. Delos Arnold for *Solariorbis arnoldi* from San Pedro.

ASTYRIS CLEMENTENSIS, new species

Plate 1, fig. 5

Shell very small, elongate-ovate. Nuclear whorls flesh colored. Postnuclear turns yellowish horn colored with various zigzag mark-

ings and fulgurations of brown. Nuclear whorls smooth. Post-nuclear whorls appressed at the summit, marked by very fine lines of growth which are almost vertical, and numerous, closely spaced, microscopic spiral striations. Suture very slightly constricted. Periphery of the last whorl well rounded. Base long, moderately rounded; columella marked by eight feebly developed spiral cords. Aperture large; posterior angle acute, decidedly channeled anteriorly; outer lip thin showing the external markings within; inner lip sinuous; parietal wall covered with a thin callus.

The type, Cat. No. 362456, U.S.N.M., was collected by Dr. R. H. Tremper on rocks at San Clemente Island, California. It has five and one-half whorls and measures, length, 3.2 mm.; diameter, 1.5 mm.

A topotype is in Doctor Tremper's collection. Cat. No. 211060, U.S.N.M., also contains one collected by S. A. L. Brannan on Catalina Island.

This species is nearest related to *Astyris aurantiaca* Dall, but is uniformly smaller.

**OPALIA TREMPERI, new species**

Plate 1, fig. 8

Shell moderately large, milk white. Nuclear whorls decollated. Postnuclear whorls marked by poorly developed, retractively slanting axial ribs which terminate at the summit in a series of cusps. Several ribs frequently fuse to form a single cusp. The ribs on the first two turns of the type are obsolete, on the third 20 are present, while the fourth has 22, the fifth 24, the sixth and last have 26. In addition to the axial sculpture there are also obsolete varices at irregular intervals. The entire surface of the spire is marked by narrow spiral cords. The spaces that separate these cords are crossed by numerous, very slender, axial threads which give them a decidedly pitted appearance. Suture slightly constricted. Periphery of the last whorl well rounded. Base rather attenuated, marked by the continuations of the axial ribs and the same type of spiral sculpture described for the spire. Aperture large, decidedly oval, with a strongly expanded and thickened peristome; outer lip evenly curved; inner lip almost straight and continuing as a heavy callus over the parietal wall which renders the peritreme complete.

The type, Cat. No. 362454, U.S.N.M., was collected by Dr. R. H. Tremper on rocks at San Clemente Island, California. It has seven and one-half whorls and measures, length, 7.8 mm.; diameter, 2.5 mm.

**MELANELLA (MELANELLA) PORTLANDICA, new species**

## Plate 1, fig. 6

Shell of moderate size, regularly elongate-conic, milk white, shining. Nuclear whorls decollated in the type. Postnuclear whorls narrow between the summit and suture with the summit appressed, very slightly rounded, marked at irregular intervals by varicial impressions. Suture only very slightly impressed. Periphery of the last whorl slightly inflated, strongly rounded. Base very short, strongly rounded. Aperture small, pyriform, oblique; posterior angle acute; peristome very much thickened; columella short, almost straight, decidedly thickened and reflected over the umbilical area as a thick callus; parietal wall covered by a thick callus.

The type, Cat. No. 362492, U.S.N.M., was donated by Mrs. I. S. Oldroyd and was collected at Portland, Oregon. It has 11.3 whorls and measures, length, 9.1 mm.; diameter, 3.1 mm.

The short thickened aperture and short base will at once distinguish this from *Melanella micans*. There is a suggestion of *Melanella (Balcis) thersites* but its straight form and general proportions differentiates it from that species.

**ACLIS CALIFORNICA, new species**

## Plate 1, fig. 2

Shell small, pupiform, thin, bluish white. Nuclear whorls not differentiated from the postnuclear turns. All the whorls well rounded, appressed at the summit which is finely crenulated, the rest marked by fine lines of growth which are somewhat retractorily slanting. The type is slightly worn and shows no indication of spiral sculpture. Sutures moderately constricted. Periphery of the last whorl inflated and strongly rounded. Base short, strongly rounded narrowly umbilicated, marked like the spire. Aperture subquadrate; posterior angle decidedly obtuse; outer lip thin; columella almost straight, reflected over and appressed to the base for its posterior fifth; parietal wall covered with a thin callus.

The type, Cat. No. 362455, U.S.N.M., was collected by Dr. R. H. Tremper on rocks at San Clemente Island. It has six whorls and measures, length 5 mm., diameter, 2.1 mm.

**TURBONILLA (PTYCHEULIMELLA) MAGDALINENSIS, new species**

## Plate 1, fig. 7

Shell elongate conic, bluish white. Nuclear whorls decollated in all our specimens. Postnuclear whorls very narrowly shouldered at the summit, flattened, somewhat contracted near the suture, marked by incremental lines and occasional indications of obsolete protract-

tively slanting riblets. The entire surface of the spire is marked, also, by exceedingly fine closely spaced incised spiral lines. Periphery of the last whorl well rounded. Base short, well rounded, marked by rather strong incremental lines and the same fine spiral sculpture that marks the spire. Aperture oval; posterior angle acute; outer lips thin; inner lip somewhat sinuous, slanting protractively, reflected over and appressed to the base for two-thirds of its length; parietal wall covered by a thin callus.

The type, Cat. No. 217930, U.S.N.M., was collected in Magdalena Bay, Lower California, by C. R. Orcutt. It has  $11\frac{1}{2}$  whorls remaining and measures, altitude, 7.4 mm.; diameter, 1.8 mm.

Cat. No. 363779, U.S.N.M., contains nine topotypes.

**TURBONILLA (STRIOTURBONILLA) KINCAIDI** Bartsch

Plate 1, fig. 3

*Turbonilla (Strioturbonilla) kincaidi* BARTSCH, Proc. Biol. Soc. Washington, vol. 34, 1921, pp. 33-34.

Shell rather broadly elongate conic, yellowish white. Nuclear whorls decollated. The remaining turns are moderately well rounded and somewhat overhanging, appressed at the summit, decidedly constricted at the suture, marked by rather depressed, slightly retractively slanting axial ribs, of which 18 occur upon the first of the remaining turns, and 20 upon all the other turns. The spaces which separate the ribs are moderately impressed and terminate roundly about one-eighth of the distance between the summit and the suture, anterior to the suture. Periphery of the last whorl well rounded. Base short, inflated, well rounded, marked by the feeble continuation of the axial ribs, which become evanescent before reaching the umbilicus. In addition to the above sculpture the entire surface of the spire and base is marked by very fine closely spaced spiral striations. Aperture rather large, very broadly oval, almost subquadrate; posterior angle obtuse; outer lip thin, showing the external sculpture within; inner lip slender, somewhat sinuous, reflected over and appressed to the base for three-fourths of its length; parietal wall covered by a moderately thick callus.

The type, Cat. No. 340844, U.S.N.M., comes from Dogfish Bay, Puget Sound. It has eight whorls remaining and measures, length, 5.5 mm.; diameter, 1.7 mm.

**TURBONILLA (CHEMNITZIA) ENGBERGI** Bartsch

Plate 1, fig. 4

*Turbonilla (Chemnitzia) engbergi* BARTSCH, Journ. Wash. Acad. Sci., vol. 10, 1920 No. 20, p. 570.

Shell small, elongate-conic, thin, semitransparent, bluish white. Nuclear whorls decollated. Postnuclear whorls moderately rounded,



appressed at the summit, marked by broad, slightly protractively slanting axial ribs, of which 14 occur upon all of the remaining turns, except the last, on which there are 16. These ribs are a little broader than the spaces that separate them, and they become slightly flattened and weaker toward the summit. The intercostal spaces are deeply depressed pits, which terminate somewhat posterior to the summit of the succeeding turn, leaving a broad, smooth band at the suture. Suture strongly constricted. Periphery of the last whorl well rounded, not crossed by the strong axial ribs. Base short, well rounded, marked by incremental lines only. Aperture subquadrate, posterior angle obtuse; outer lip thin; inner lip slightly sinuous, decidedly obliquely inserted, the inner edge having a decidedly protractive slant; parietal wall devoid of callus.

The type, Cat. No. 334489, U.S.N.M., was collected by Dr. C. C. Engberg at San Juan Island, in the Gulf of Georgia. It has almost eight whorls remaining and measures, altitude, 3.7 mm.; diameter, 1.1 mm. Cat. No. 363782, U.S.N.M., contains a paratype from the same source. Four additional specimens from the same station are in Doctor Engberg's collection.

Cat. No. 347292, U.S.N.M., contains a specimen collected by Doctor Engberg in Friday Harbor, Washington, and Cat. No. 340866, U.S.N.M., contains 8 specimens from Washington without specific locality, also from Doctor Engberg; 10 more from the same station are in the Engberg collection.

This species occurs considerably farther north than any heretofore known *Chemnitzia*.

**TURBONILLA (FRYGOLAMPROS) STELLERI, new species**

**Plate 2, fig. 4**

Shell very regularly elongate-conic, flesh colored, with a broad zone of pale brown which extends from a little anterior to the periphery on the base posteriorly over half of the whorl. Nuclear whorls decollated. Postnuclear whorls appressed at the summit, which is very narrowly shouldered, decidedly flattened in the middle, and moderately constricted at the suture, marked by very regular, vertical axial ribs, of which 16 occur upon all but the last two turns, on which 18 are present. These ribs are about as wide as the spaces that separate them, on the first three turns; on the middle turns they are only half as wide, while on the last turn the intercostal spaces are about one and one-half times as wide as the ribs. In addition to the axial ribs the whorls are marked by fine lines of growth and numerous, very closely spaced spiral striations, which extend over both ribs and intercostal spaces. Periphery of the last whorl well rounded. Base short, well rounded, marked by the feeble continua-

tions of the axial ribs, which evanesce shortly after passing the periphery, and numerous, closely spaced spiral striations. Aperture large, subquadrate, posterior angle obtuse; outer lip thin showing the external sculpture and color markings within; columella somewhat twisted, almost vertical, slightly reflected and appressed to the base for the posterior third of its length; parietal wall covered with a thin callus.

The type, Cat. No. 362146, U.S.N.M., comes from Shuyak Strait, Afognak Island, Alaska. It has nine postnuclear whorls and measures, length, 8.3 mm.; diameter, 2.2 mm. This species is a member of the *Turbonilla* (*Pyrgolampros*) *halia* Dall and Bartsch group. It differs from the other known members by its coloration and flattened whorls, as well as by its size.

**TURBONILLA (PYRGOLAMPROS) ILFA, new species**

Plate 1, fig. 1

Shell very large. Nuclear whorls decollated. The eight and a quarter turns remaining narrowly shouldered at the summit, slightly rounded in the middle, somewhat contracted toward the base, marked by strong, well-rounded axial ribs, which are closely spaced on the early whorls, rather distantly on the middle whorls, and again closely placed on the last turn, where they become somewhat enfeebled. Of these ribs, which are almost vertical, 22 occur upon the first of the remaining turns, 24 upon the second to sixth, 26 upon the seventh and 30 upon the last. The spaces between the ribs are strongly impressed and almost as wide as the ribs on the first two turns. On the next four they are decidedly wider than the ribs, while on the next to the last they again equal the ribs and on the last they are narrower. The entire surface of the spire is marked, in addition, by fine spiral striations. Periphery of the last whorl well rounded. Base moderately long, well rounded, marked by the feeble continuations of the axial ribs and the fine microscopic spiral striations. Aperture oval; posterior angle acute; outer lip thin; inner lip somewhat sinuous, reflected over, but not appressed to the base; parietal wall covered by a thick callus.

The type, Cat. No. 340819, U.S.N.M., was collected by A. G. Smith at San Pedro, Calif. It has eight and a quarter whorls and measures, length, 12.5 mm.; diameter, 4 mm. This is the largest of the known West American *Pyrgolampros*.

**TURBONILLA (PYRGOLAMPROS) SHUYAKENSIS, new species**

Plate 2, fig. 1

Shell broadly conic, stout, flesh colored, with a broad band of chestnut brown encircling the periphery. This band extends almost

as far anterior to the periphery as it does upon the base. Nuclear whorls decollated. Postnuclear whorls rather inflated, appressed at the summit, slightly rounded near the summit and the periphery and somewhat flattened in the middle, marked by very strong, slightly protractively curved, rounded axial ribs, of which 16 occur upon the first four of the remaining turns, and 18 upon the rest. The intercostal spaces, which are about as broad as the ribs, are deeply impressed. In addition to the strong axial ribs, the whorls are marked by fine incremental lines which are apparent in both intercostal spaces and on the ribs; they are also marked by rather strong, closely spaced spiral striations. Suture strongly impressed, constricting the whorls. Periphery angulated. Base short, slightly inflated, well rounded, marked by the very feeble continuations of the axial ribs, which evanesce shortly after passing the periphery, numerous lines of growth, and closely spaced, strong spiral striations. Aperture rather large, broadly oval, posterior angle obtuse; outer lip thin, showing the external markings as well as the color bands within; columella slender, slightly curved, and slightly reflected over the base to which it is appressed for the posterior half of its length.

The type, Cat. No. 362144, U.S.N.M., comes from Shuyak Strait, Afognak Island, Alaska. It has six and one-half whorls, and measures, length, 6.3 mm.; diameter, 2.4 mm.

This species is nearest related to *Turbonilla*, (*Pyrgolampros*) *newcombei* Dall and Bartsch, which is known from British Columbia and Washington. It differs from the latter in being in every way more robust and in having the whorls more inflated.

**TURBONILLA (PYRGOLAMPROS) MIDDENDORFFI, new species**

Plate 2, fig. 2

Shell elongate-conic, flesh colored, excepting a broad band of bright chestnut brown which extends over the periphery and considerably anterior and posterior to this. Nuclear whorls two and one-half, forming a depressed helicoid spire, the axis of which is almost at right angles to that of the succeeding turns, in the first of which the nuclear spire is about one-sixth immersed. Postnuclear whorls rather high, appressed at the summit, marked by broad, low, rather closely spaced, almost vertical axial ribs, which are very feebly expressed on the early turns. Of these ribs there are 18 on the third, 20 on the fourth and fifth, 22 on the sixth, and 24 on the last whorl. The spaces separating the ribs are only about one-half as wide as the ribs. In addition to the axial sculpture the whorls are marked by numerous, closely spaced, spiral striations. Suture moderately constricted. Periphery of the last whorl somewhat inflated. Base moderately long, inflated, marked by the feeble continuations of

the axial ribs, which evanesce shortly after passing the periphery, and numerous, closely spaced spiral striations. Aperture rather large, posterior angle acute; outer lip thin, showing the external markings and color band within; columella slender, somewhat sinuous, slightly reflected over the base to which the posterior third is adnate; parietal wall covered by a thin callus.

The type, Cat. No. 362147, U.S.N.M., has seven and one-half post-nuclear whorls and measures, length, 6.4 mm.; diameter, 2.0 mm. It comes from Shuyak, Afognak Island, Alaska.

**TURBONILLA (PYRGOLAMPROS) EYERDAMI, new species**

Plate 2, fig. 12

Shell large, elongate-conic, golden yellow, with a moderately broad band of pale chestnut brown at the periphery. Nuclear whorls decollated. Postnuclear whorls appressed at the summit which is narrowly shouldered, flattened in the middle, moderately constricted at the suture, marked by rather strong, regular and regularly spaced, axial ribs, which are slightly protractively slanting on the early turns, vertical in the middle, and slightly retractively slanting on the last whorl. Twenty-two of these ribs occur upon the first to the third turns, 20 upon the fourth to the seventh, 18 upon the eighth, 22 upon the ninth, and 30 upon the last whorl. These ribs are about as wide as the spaces that separate them. The ribs and the intercostal spaces are marked by numerous, closely spaced spiral striations. Suture moderately constricted. Periphery of the last whorl inflated, well rounded. Base short, somewhat inflated, well rounded, marked by the feeble continuations of the axial riblets, which evanesce shortly after passing the periphery, and numerous lines of growth and closely spaced spiral striations. Aperture oval, posterior angle acute, outer lips thin, showing the external sculpture and the color markings within; columella slightly curved, reflected over and appressed to the base for half of its length; parietal wall covered by a thin callus.

The type, Cat. No. 362145, U.S.N.M., comes from Shuyak Strait, Afognak Island, Alaska. It has lost the nucleus. The  $10\frac{1}{2}$  post-nuclear whorls measure, length, 10.5 mm.; diameter, 2.7 mm. This is a member of the *Turbonilla* (*Pyrgolampros*) *halia* Dall and Bartsch group. It is not particularly closely related to any of the described species.

**TURBONILLA (PYRGISCUS) DELMONTENSIS Bartsch**

Plate 2, fig. 11

Shell elongate conic, golden brown, with the incised spiral lines edged with red. Nuclear whorls decollated. Postnuclear whorls

moderately rounded, narrowly shouldered at the summit, crossed by strong, slightly protractively slanting axial ribs, of which 14 occur upon the fourth and fifth of the remaining turns, 16 upon the sixth, 18 upon the seventh, 22 upon the eighth, and 28 upon the last whorl, upon which they are somewhat enfeebled and less regularly developed and spaced. The intercostal spaces are about twice as wide as the ribs and are crossed by six equally spaced incised spiral lines, of which the second is about three times as wide as the first, third, and fourth, while the fifth and sixth have about double the width of the narrow ones. Suture strongly constricted. Periphery of the last whorl well rounded, somewhat inflated. Base, short, moderately rounded, marked by somewhat irregularly spaced and irregularly developed fine spiral lines, of which there are more than 15. The exact number can not be determined on account of the erosion of the base. Aperture short, almost subquadrate; posterior angle obtuse; outer lip thin, showing the external sculpture within; inner lip almost vertical, reflected over and appressed to the base for almost half its length.

The type, Cat. No. 340818, U.S.N.M., was dredged by A. G. Smith in 10 fathoms off Del Monte, California. It has nine postnuclear whorls and measures, length, 9.7 mm.; diameter, 2.7 mm. This species is nearest related to *Turbonilla* (*Pyrgiscus*) *auricoma* Carpenter and *Turbonilla* (*Pyrgiscus*) *castanea* Keep.

**TURBONILLA (MORMULA) ENNA, new species**

Plate 2, fig. 8

Shell elongate-conic, pale brown. Nuclear whorls decollated. Postnuclear whorls marked by very slightly retractorily slanting, low, poorly developed, axial ribs which are a little broader than the spaces that separate them. Of these ribs, 18 occur upon the second, 22 upon the third and fourth, 24 upon the fifth and sixth, 26 upon the seventh, while upon the remaining turns they become more irregular and more numerous and ill-defined. In addition to this the whorls are marked by five spiral lines of pits in the intercostal spaces which extend up on the sides of the ribs but scarcely cross them. These pits are a little narrower than the spaces that separate them. There are also at irregular intervals indications of varices. Aperture moderately large, oval, posterior angle obtuse; outer lip fractured, showing six strong spiral folds within, of which three are anterior and three posterior to the periphery; columella slightly expanded and reflected over the umbilicus; parietal wall covered by a rather thick callus.

The type, Cat. No. 362440, U.S.N.M., was collected by Dr. R. H. Tremper, in 6 fathoms, off Dead Mans Island, San Pedro, California,

It has almost nine whorls remaining and measures, length, 11.6 mm., diameter, 2.8 mm.

**TURBONILLA (MORMULA) CLEMENTINA, new species**

Plate 2, figs. 9, 10

Shell broadly elongate-conic, chestnut brown. Nuclear whorls a little more than two, forming a depressed helicoid spire, the axis of which is at right angles to that of the succeeding turns, in the first of which the nuclear spire is about one-fifth immersed. The nuclear whorls project slightly beyond the left outline of the postnuclear spire. First postnuclear whorl well rounded, the succeeding five somewhat shouldered, about one-third the distance between the summit and the suture, anterior to the summit, while the last three are slightly rounded and rendered slightly concave below the somewhat excurved summit. The whorls are marked by slightly protractive axial ribs, which are strong on the early whorls and become enfeebled on the later turns. Of these ribs, 24 occur upon the first, 20 upon the second, 18 upon the third, 20 upon the fourth and fifth, 24 upon the sixth, 26 upon the seventh, 30 upon the eighth, and 34 upon the last turn. The spaces which separate these ribs are a little narrower than the ribs on the early turns, and about equal to the ribs on the last turn. In addition to the axial ribs the whorls are marked by six strong, incised spiral lines, which almost equally divide the posterior three-fourths of the whorls. The space between the summit and the first strongly incised pit is marked by five fine incised spiral lines, while the space between the fourth and fifth pit is also divided by a fine spiral line, which is a little nearer the fourth pit than the fifth. Sutures rendered rather conspicuous by the very narrowly shouldered summit of the whorls. Periphery of the last turn well rounded. Base short, well rounded, marked by 15 incised spiral lines, which gradually diminish in spacing and strength from the periphery to the umbilicus. The six at the umbilical region are very fine and very closely crowded. The rest increase regularly in size and spacing, excepting the fourth anterior to the periphery, which is much finer than the third and fifth. Aperture subquadrate; posterior angle obtuse; outer lip thin; inner lip almost vertical, reflected over and appressed posteriorly for about one-third of its distance to the base; parietal wall covered by a thin callus.

The type, Cat. No. 340933, U.S.N.M., comes from San Clemente Island, California. It has nine and a half whorls and measures length, 7.6 mm.; diameter, 2.3 mm. This species is nearest related to *Turbonilla* (*Pyrgolampros*) *dora* Bartsch.

## ODOSTOMIA (SALASSIA) OENOA, new species

## Plate 2, fig. 3

Shell rather large, conic, grayish white. Nuclear whorls decolated. Postnuclear whorls rather high between the summit and the periphery, slopingly shouldered at the summit, marked by 24 somewhat retractively slanting, axial riblets which are separated by shallow intercostal spaces, the latter being a little narrower than the riblets. These riblets extend from the summit to the periphery while from the periphery basally they gradually evanesce. Suture rather strongly constricted. Base moderately long, well rounded. Aperture oval; posterior angle obtuse; columella provided with a strong oblique fold which is situated a little anterior to the insertion of the columella; parietal wall covered by a rather thick callus.

The type, Cat. No. 362441, U.S.N.M., was collected by Dr. R. H. Tremper in 6 fathoms off Dead Mans Island, San Pedro, California. It has almost seven whorls and measures, length 7 mm., diameter, 2.1 mm.

## ODOSTOMIA (CHRYSTALLIDA) FIA, new species

## Plate 3, fig. 8

Shell elongate-ovate, cream-yellow. Nuclear whorls deeply immersed in the first of the postnuclear turns above which the tilted edge of the last volution only projects. Postnuclear whorls strongly shouldered at the summit, and decidedly constricted at the suture, moderately rounded, marked by three strongly tuberculated spiral ridges and a fourth smooth one between the summit and the suture. These ridges are crossed by strong, somewhat retractively slanting axial ribs, of which 18 occur upon the second, 20 upon the third, and 18 upon the penultimate turn. The junction of the spiral cords and axial ribs form strong nodules which are almost hemispherical, while the spaces inclosed between them form deep rounded pits. The space between the third and the fourth, or smooth spiral cord, is crossed by fine threadlike axial riblets. Suture deeply channeled. Periphery of the last whorl strongly rounded. Base rather long, well rounded, marked by six strong slightly flattened spiral cords which grow successively weaker from the periphery toward the tip of the base. The spaces separating these cords also grow consecutively a little less in width, and are crossed by numerous fine threadlike axial riblets. Aperture rather large, effuse anteriorly; posterior angle obtuse; outer lip rendered sinuous by the external sculpture; inner lip reflected and appressed to the base for almost its entire length, provided with a moderately strong fold at its insertion; parietal wall covered with a thin callus.

The type, Cat. No. 363780, U.S.N.M., was collected by C. R. Orcutt in Todos Santos Bay. It has four and one-half whorls and measures, length, 3 mm., diameter, 1.5 mm.

**ODOSTOMIA (CHRYSALLIDA) ERA, new species**

Plate 3, fig. 9

Shell elongate-conic, semitranslucent, bluish white. Nuclear whorls decollated. Postnuclear whorls narrowly shouldered at the summit, slightly constricted at the suture, marked by strong slightly protractively slanting axial ribs, of which 16 occur upon the second and third, 18 upon the fourth to sixth, and 22 upon the last. These ribs are a little narrower than the spaces that separate them. They are crossed by six spiral cords, of which the first is at the summit. This is rather weak, the one below the summit being the strongest, and the next four are weaker and of about the same strength and spacing. The spiral cords render the ribs slightly nodulose at their junction, while the spaces inclosed between them are rather deep pits of which those between the summit and the first spiral cord below it have their long axis parallel with the axial ribs, while those between the first and second are rounded. The rest are slightly oblong, having their long axis parallel with the spiral cords. Suture slightly constricted. Periphery of the last whorl well rounded. Base moderately long, well rounded, marked by 11 strong broad spiral cords which are separated by narrow channels. These cords grow successively weaker from the periphery toward the tip of the base. Aperture somewhat irregular effuse anteriorly; posterior angle acute; outer lip thin, showing the external sculpture within by transmitted light; inner lip twisted, reflected over and appressed to the base for almost its entire length, provided with a moderately strong fold at its insertion; parietal wall covered by a rather thick callus.

The type, Cat. No. 217931, U.S.N.M., was collected by C. R. Orcutt in Magdalena Bay. It has seven and one half whorls having lost the nucleus, and measures, length, 4.1 mm.; diameter, 1.4 mm.

**ODOSTOMIA (CHRYSALLIDA) CUMSHEWAENSIS Bartsch**

Plate 3, fig. 10

*Odostomia (Chrysallida) cumshewaensis* BARTSCH, Proc. Biol. Soc. of Wash., vol. 34. 1921, p. 34.

Shell broadly elongate-conic, milk-white, nuclear whorls at least two, obliquely immersed in the first of the postnuclear whorls, above which about two-thirds of the nuclear spire projects. Postnuclear whorls strongly rounded, constricted at the periphery, marked by strong, retractively slanting axial ribs, of which 16 occur upon the



first, 18 upon the second, 22 upon the third and the penultimate turn. These ribs are crossed by four strong spiral cords which are a little wider than the ribs and render the axial ribs tuberculated, the first row of tubercles at the summit being decidedly smaller than the two that succeed it. All three of these have the tubercles strongly, evenly rounded. The fourth immediately above the periphery, however, has the spiral cord stronger than the axial ribs, and appears as an almost uninterrupted cord with feebler tubercles. The pits inclosed between the ribs and spiral cords are strongly impressed and rounded. Suture strongly constricted, a part of the first basal cord showing at the suture of the last two turns. Periphery well rounded, marked by a strong spiral cord. Base moderately long, marked by five spiral cords on the anterior three-fourths, which become succeeding narrower and feebler, the last two being indicated merely by the incised lines that separate them. The anterior fourth of the base is smooth, excepting incremental lines. The spaces between the spiral cords on the base are crossed by fine axial threads. Aperture very broadly oval; posterior angle obtuse; outer lip thin, showing the external sculpture within, inner lip strongly curved, reflected over and appressed to the base, a very narrow chink remaining behind the lip, indicating a very slight umbilicus; parietal wall covered by a thick callus.

The type, Cat. No. 340860, U.S.N.M., was collected by Mrs. Oldroyd at Cumshewa Inlet, British Columbia. It has five post-nuclear whorls and measures, length, 2.7 mm.; diameter, 1.2 mm.

This species suggests *Odostomia* (*Chrysallida*) *astriata* Dall and Bartsch from Monterey, but differs from it in being more conic, with the whorls more rounded and having the base shorter and more rounded, as well as in minor details of sculpture.

ODOSTOMIA (CHRYSTALLIDA) TREMPERI, new species

Plate 3, fig. 1

Shell very elongate-conic, bluish white. Nuclear whorls at least two, smooth, forming a depressed helicoid spire, the axis of which is obliquely immersed in the first of the succeeding turns above which a little less than half the nuclear spire projects. Postnuclear whorls marked by rather strong, retractively slanting, axial ribs which are a little broader than the spaces that separate them. Of these ribs 14 occur upon the first, 16 upon the second to fourth, 18 upon the fifth and last turns. In addition to this the whorls are marked by four spiral cords which render the junction with the axial ribs tuberculated. The tubercles are rounded on the middle whorls and slightly elongated on the last turn, the elongation corresponding with the spiral sculpture. The spaces inclosed between the

axial ribs and the spiral cords are deeply impressed, rounded pits. Suture strongly constricted, channeled. Periphery of the last whorl marked by a rather broad channel. Base rather long, marked by eight spiral cords of which the first two, near the periphery, are much stronger than the rest, the others becoming successively weaker. In addition to this the deep channels between the spiral cords are crossed by numerous, slender, axial threads which give them a finely ribbed appearance. Aperture elongate-oval; decidedly angulated anteriorly; posterior angle acute; outer lip thin showing the external sculpture within, and sinuous at the edge; columella twisted, provided with a rather oblique fold a little anterior to its insertion; parietal wall covered by a rather thick callus.

The type, Cat. No. 362446, U.S.N.M., was collected by Dr. R. H. Tremper on rocks at San Clemente Island, California. It has six and one-half postnuclear whorls and measures: Length 3.7 mm.; diameter, 1.2 mm.

A topotype of this species is in Doctor Tremper's collection.

**ODOSTOMIA (CHRYSTALLIDA) CLEMENTENSIS, new species**

Plate 3, fig. 2

Shell very broadly conic, bluish white. Nuclear whorls decolored. Postnuclear whorls increasing rapidly in size, marked by poorly developed, axial ribs which are strongest near the summit, but evanesce before reaching the periphery. Of these 20 occur upon all the whorls. These ribs are a little wider than the spaces that separate them. In addition to these ribs the whorls are marked by five spiral cords between the summit and periphery, of which the first three are narrow and of about equal width and occupy the posterior half of the turns. These render the axial ribs tuberculate, the tubercles being elongate, the elongation corresponding with the spiral sculpture. The anterior two spiral cords are much broader. The posterior of these is feebly tuberculate, while the anterior is smooth. The spaces separating the spiral cords on the spire are of the same width, and the spaces inclosed between the axial ribs and spiral cords are narrow elongated pits, the long axes of which coincide with the spiral sculpture. These spiral pits pass up on the sides of the ribs and usually cross them. The first supraperipheral incised spiral line not being interrupted by ribs forms a continuous pitted element. Periphery of the last whorl well rounded, marked by a narrow, deeply incised channel which is also crossed by fine axial threads that render it pitted. Base well rounded, marked by 13 spiral cords, of which the anterior 3 are very feeble, while the rest are very regular in size and spacing, becoming successively a little more slender from the periphery anteriorly. The spaces that

separate these cords are almost as wide as the cords and are marked by slender axial threads which give to the spiral grooves a strongly pitted appearance. Aperture large; posterior angle obtuse; somewhat channeled at the junction of the columella and basal wall and decidedly flaring at the junction of the outer lip and basal lip; outer lip thin, showing the external sculpture within by the transmitted light, sinuous at the edge; columella very stout, rather evenly curved, provided with an oblique fold a little anterior to its insertion; parietal wall glazed with a thin callus.

The type, Cat. No. 362447, U.S.N.M., was collected by Dr. R. H. Tremper on rocks at San Clemente Island, California. It has a little more than four postnuclear whorls, having lost the nuclear turns, and measures, length 3.2 mm.; diameter, 1.9 mm.

ODOSTOMIA (CHRYSTALLIDA) CHACEI, new species

Plate 3, fig. 3

Shell elongate-ovate, bluish white. Nuclear whorls two and one-half, well rounded, forming a depressed helicoid spire which is about one-half obliquely immersed in the first of the succeeding turns. The tilted edge of the last volution shows four rather strong spiral cords. Postnuclear whorls stout, separated by a profoundly channeled suture, marked by exceedingly strong axial ribs which on all but the last whorls are slightly protractive; on the latter they are almost vertical. Of these ribs 16 occur upon the second and third and 18 upon the penultimate turn. The intercostal spaces are about as wide as the ribs. In addition to the axial sculpture the whorls are marked by four strong spiral cords which render their junction with the axial ribs strongly tuberculated. The tubercles are almost hemispherical, sloping only very slightly, a little more abruptly posteriorly than anteriorly. The spaces inclosed between the axial ribs and the spiral cords are well-rounded profound pits. The summit of the whorls is tabulated. The summits of the strong ribs render the suture slightly sinuate. Periphery of the last whorl marked by a rather strong spiral cord. Base moderately long, well rounded, marked by five spiral cords which become slightly closer spaced from the peripheral cord anteriorly and also decidedly progressively enfeebled in the same direction. The broad spaces that separate the spiral cords are marked by numerous, slender, axial threads. Aperture oval; posterior angle obtuse; outer lip thin, showing the external sculpture within by transmitted light; inner lip slightly curved, appressed to the succeeding whorl for two-thirds of its length, the anterior third only being free; parietal wall covered with a thick callus.

The type, Cat. No. 361626, U.S.N.M., was collected by E. P. Chace, at Cayucos, California. It has five postnuclear whorls and measures, altitude, 2.9 mm.; diameter, 1.8 mm.

*ODOSTOMIA (CHRYSTALLIDA) CATALINENSIS*, new species

Plate 3, fig. 4

Shell minute, bluish white, semitranslucent. Nuclear whorls deeply obliquely immersed in the first postnuclear turn, above which the tilted edge of the last turn only projects. Postnuclear whorls moderately rounded; marked by four strong spiral cords which are much wider than the spaces that separate them. Of these the first is at the summit. The axial sculpture is decidedly reduced on the first turn, becoming stronger on the second, while on the third there are 18 axial ribs which equal the spiral cords in strength. The junction of the axial ribs and spiral cords here form strong tubercles on the anterior three spiral cords, while the fourth is only slightly tuberculated. On the last whorl the axial ribs are very irregular and enfeebled. Here the axial sculpture consists chiefly of lines of growth, which are particularly conspicuous in the grooves between the spiral cords, where they appear as slender riblets. Particularly is this true in the groove at the periphery. Periphery well rounded. Base moderately long, well rounded, marked by seven spiral cords which grow successively narrower from the periphery toward the base, the last one at the base being a little wider than those immediately preceding it. Aperture oval, somewhat effuse anteriorly; posterior angle obtuse; outer lip thin, showing the external markings within by transmitted light; columella, slightly oblique, strongly reflected and appressed to the base, leaving only a very small chink at the umbilical area, and provided with a strong oblique fold at its insertion; parietal wall covered with a moderately thick callus.

The type, Cat. No. 347989, U.S.N.M., was collected by A. M. Strong, on *Abalone* at Catalina Island, California. It has four and one-half postnuclear whorls and measures, length, 3.1 mm.; diameter, 1.6 mm.

Twenty-four additional specimens from the same locality are in the Museum collection as Cat. No. 347990.

More than a hundred additional specimens from the same locality are in Mr. Strong's collection.

*ODOSTOMIA (EVALEA) BACHIA*, new species

Plate 2, fig. 7

Shell very regularly elongate ovate, bluish white. Nuclear whorls deeply obliquely immersed in the first of the postnuclear turns above which a small portion of the tilted edge of the last turn only pro-

jects, which gives to the shell a decidedly truncated appearance. Postnuclear whorls rather high between the summit and the suture very slightly rounded, appressed at the summit and very slightly contracted at the periphery, marked by very fine lines of growth and numerous, closely spaced, microscopic spiral striations. This sculpture is characteristic for the early whorls as well as the last. Suture slightly constricted. Periphery of the last whorl strongly inflated, rather obtusely angulated. Base short, strongly rounded, narrowly umbilicated, marked like the spire. Aperture broadly oval; posterior angle obtuse; outer lip thin; inner lip slightly curved, reflected over and appressed to the base and provided with an oblique fold a little anterior to its insertion; parietal wall covered with a thick callus.

The type, Cat. No. 362450, U.S.N.M., was collected by Dr. R. H. Tremper on rocks at San Clemente Island, California. It has five and one-half whorls and measures, length, 3.6 mm.; diameter, 1.6 mm.

Cat. No. 362451, U.S.N.M., contains a topotype, and three additional topotypes are in Doctor Tremper's collection.

**ODOSTOMIA (EVALEA) EYERDAMI, new species**

Plate 4, fig. 1

Shell small, very elongate-ovate, bluish white. Nuclear whorls deeply obliquely immersed in the first of the succeeding turns above which the tilted edge of the last volution only projects. Postnuclear whorls high, moderately rounded, very slightly shouldered at the summit, marked by moderately strong, equal, and equally spaced spiral striations which have about the same strength on all the whorls. Periphery somewhat inflated, well rounded. Base slightly prolonged, well rounded, marked like the spire by lines of growth and spiral striations. Aperture elongate-ovate, protracted at the junction of the base and columella; posterior angle acute; outer lip thin; columella slightly oblique, almost straight, slightly reflected and appressed to the base for about half of its length; parietal wall covered with a thin callus.

The type, Cat. No. 362149, U.S.N.M., comes from Shuyak Strait, Afognak Island, Alaska. It has five postnuclear whorls and measures, length, 4.3 mm.; diameter, 2.0 mm.

This species is nearest related to *Odostomia (Evalea) stephensi* Dall and Bartsch, from which it differs in being constantly, in every way, smaller.

Cat. No. 362150, U.S.N.M., contains an additional specimen from the type locality, while five are in the collection of Walter J. Eyerdam.

**ODOSTOMIA (EVALEA) WHITEI, new species**

Plate 4, fig. 3

Shell very small, elongate-ovate, bluish white. Nuclear whorls smooth, deeply obliquely immersed in the first of the postnuclear turns above which the tilted edge of the last volution only projects. The nuclear spire is so obliquely placed that it gives the apex of the shell a truncated appearance. Postnuclear whorls very slightly rounded, not appressed at the summit, marked by rather strong, and deeply incised spiral lines; one a little heavier than the rest is situated a little below the summit and gives to this the appearance of being slightly keeled. In addition to this sculpture the whorls are marked by rather coarse lines of growth. Periphery of the last whorl angulated. Base short, well rounded, not umbilicated, marked by the continuation of the axial ribs and incised spiral lines which equal those on the spire in strength. Aperture pear-shaped; posterior angle acute; outer lip thin; columella slightly curved, reflected over and appressed to the base for its posterior two-thirds, and provided with a strong, oblique fold opposite the umbilical chink; parietal wall covered with a heavy callus.

The type, Cat. No. 362545, U.S.N.M., was collected by A. M. Strong at Point Firmin, California. It has 4.8 whorls and measures: Length, 2.2 mm.; diameter, 1.2 mm.

A topotype is in Mr. Strong's collection.

**ODOSTOMIA (EVALEA) STRONGI, new species**

Plate 4, fig. 4

Shell small, elongate-ovate, pale yellow, translucent. Nuclear whorls deeply obliquely immersed in the first postnuclear whorl, only half of the last turn showing, which is well rounded and smooth. The early postnuclear whorls moderately rounded, marked by strong spiral grooves which separate the whorl into equal cords, of which 10 occur on the second whorl in the type. On the third whorl these cords become very much enfeebled and on the last they are entirely obsolete. On the last whorl the incremental lines are more conspicuous than on the preceding turns, probably largely due to the absence of spiral sculpture. Suture well impressed. The portion at the summit of the shell appressed to the preceding turn appears as an opaque band. Periphery well rounded. Base rather long, well rounded, not umbilicated. Aperture elongate oval; outer lip thin, rather sigmoid; inner lip thin, reflected over and appressed to the base for three-fourths of its length, the anterior portion only

being free, provided with a fold at the insertion of the columella; parietal wall covered by a thin callus.

The type, Cat. No. 347804, U.S.N.M., was taken from *Abalone* at Catalina Island by A. M. Strong. It has almost four postnuclear whorls and measures, length, 3.5 mm.; diameter, 1.8 mm.

Cat. No. 347805, U.S.N.M., contains 10 additional specimens of various ages from the same gathering, while 63 from the same lot, of different ages, are in Mr. Strong's collection.

**ODOSTOMIA (AMAURA) SANJUANENSIS Bartsch**

Plate 2, fig. 6

*Odostomia (Amaura) sanjuanensis* BARTSCH, Journ. Wash. Acad. Sci., vol. 10, 1920, No. 20, p. 571.

Shell elongate-ovate, wax yellow. Nuclear whorls decollated. Postnuclear whorls narrowly tabulatedly shouldered, moderately rounded, marked by regular retractorily slanting lines of growth and fine spiral striations, which give to the surface a cloth-like texture when subjected to high magnification. In addition to this sculpture, the surface of the shell is marked by strong incremental lines and more or less irregular and irregularly distributed spiral threads, which produce a malleated pattern. Suture strongly marked. Periphery of the last whorl well rounded. Base moderately long, well rounded, marked like the spire. Aperture obliquely ovate; posterior angle obtuse; outer lip thin; inner lip very obliquely retractorily slanting, somewhat flexuose and provided with a strong fold at its insertion; parietal wall covered by a thin callus.

The type, Cat. No. 334491, U.S.N.M., was collected by Dr. C. C. Engberg near San Juan Island, Gulf of Georgia. It has five and one-half whorls and measures, altitude, 7.2 mm.; diameter, 3.5 mm. Another specimen from the same locality is in Doctor Engberg's collection.

Cat. No. 340880, U.S.N.M., contains four specimens collected by Doctor Engberg at Olga, Washington. Cat. No. 340881, U.S.N.M., contains five specimens collected by Doctor Engberg at Washington. Fifteen more specimens are in the Engberg collection. Cat. No. 347293, U.S.N.M., contains 50 specimens collected by Doctor Engberg at Sinclair Island, Washington. Many more from the same station are in Doctor Engberg's collection.

**ODOSTOMIA (AMAURA) WASHINGTONA, new species**

Plate 4, fig. 10

Shell rather large, turreted, broadly elongate-conic. Nuclear whorls decollated. Postnuclear whorls broadly, tabulatedly shoul-

dered at the summit, rather high between the angle at the summit and the suture, marked by rather coarse incremental lines which frequently show heavy erosion marks; in fact, the early whorls are badly eroded. In addition to this, the whorls are marked by fine spiral striations. Suture rendered conspicuous by the tabulated shoulder. Periphery strongly rounded. Base moderately long, somewhat inflated, strongly rounded, marked by the lines of growth and the fine spiral sculpture characteristic of the spire. There is a slight umbilical chink but not a perforation. Aperture rather large, oval, posterior angle obtuse; outer lip thin; columella oblique, slightly expanded and reflected, and provided with a strong oblique fold at its insertion; parietal wall covered with a thin callus.

The type, Cat. No. 334490, U.S.N.M., was collected by Dr. C. C. Engberg off San Juan Island, Gulf of Georgia, Washington. It has 6.2 postnuclear whorls, the nucleus being lost, and measures, length 8.6 mm.; diameter, 4.2 mm.

**ODOSTOMIA (AMAURO) ENGBERGI Bartsch**

Plate 5, fig. 5

*Odostomia (Amauro) engbergi* BARTSCH, Journ. Wash. Acad. Sci., vol. 10, 1920, No. 20, pp. 570-571.

Shell elongate-ovate, yellow, a little paler toward the tip. Nuclear whorls eroded in all the specimens seen. Postnuclear whorls narrowly tabulatedly shouldered at the summit, quite strongly rounded, marked by very fine slightly slanting lines of growth and equally fine spiral striations; the combination, when viewed under the microscope, gives to the surface a clothlike texture. Suture strongly marked. Periphery of the last whorl inflated, strongly rounded. Base strongly rounded. Aperture narrowly ovate; posterior angle very obtuse; outer lip thin; inner lip short, very oblique, somewhat sinuous, reflected over the base and appressed to it except at the extreme tip, which alone is free; a strong fold is present on the inner lip a little anterior to its insertion; parietal wall covered by a thin callus.

The type, Cat. No. 334492, U.S.N.M., was collected by Dr. C. C. Engberg off San Juan Island, Gulf of Georgia. It has a little more than five whorls and measures, altitude, 7 mm.; diameter, 3.4 mm. Cat. No. 368783, U.S.N.M., contains three paratypes from the same source. Eight additional specimens from the same station are in Doctor Engberg's collection.



The following additional specimens are in the collection of the United States National Museum:

U.S.N.M. Cat. No.	Number of speci- mens	Collector	Locality
340829	2	Mrs. T. S. Oldroyd-----	Roots of Eelgrass at Turn Island, Puget Sound.
340882	<sup>1</sup> 20	Dr. C. C. Engberg-----	Washington.
340883	<sup>2</sup> 12	-----do-----	Olga, Washington.
340930	10	-----do-----	Do.
342269	<sup>3</sup> 10	-----do-----	Ballard Beach, Seattle, Wash- ington.
347292	<sup>4</sup> 5	-----do-----	Friday Harbor, Washington.
361955	<sup>4</sup> 15	-----do-----	Do.

<sup>1</sup> There are a hundred more from this station in Doctor Engberg's collection.

<sup>2</sup> There are 23 more from the same locality in Doctor Engberg's collection.

<sup>3</sup> There are 4 more from the same locality in Doctor Engberg's collection.

<sup>4</sup> More specimens are in Doctor Engberg's collection.

#### CERITHIOPSIS FRASERI Bartsch

Plate 5, fig. 8

*Cerithiopsis fraseri* BARTSCH, Proc. Biol. Soc. Wash., vol. 34, 1921, pp. 34-35.

Shell elongate conic, chestnut brown. Nuclear whorls decollated. Postnuclear whorls almost flattened, marked by moderately strong, rounded, slightly retractorily slanting axial ribs, of which 18 occur upon the first, 16 upon the second to fourth, 18 upon the fifth, 20 upon the sixth and seventh, 26 upon the eighth and the last whorl. Intercostal spaces about half as wide as the ribs. The spiral sculpture consists of three strong cords, of which the first, at the summit, is a little less strong on the early whorls than the other two, but on the last two whorls it equals the other two cords. The intersection of the axial ribs and the spiral cords forms strong tubercles rounded on the first cord, slightly truncated posteriorly on the median cord, and strongly rounded anteriorly and strongly truncated on the third cord posteriorly, and gently sloping anteriorly. The spaces inclosed between the axial ribs and spiral cords are well-rounded pits. Suture strongly impressed, the extreme appressed portion of the summit appearing as a slender sinuous spiral thread. Periphery of the last whorl marked by a sulcus about half as wide as that separating the median from the third cord. Base short, well rounded, marked by the feeble continuations of the axial ribs, which extend more or less threadlike over the base, and two strongly impressed spiral lines on the posterior fourth of the base. The space separating the first from the second of these spiral lines is about as wide as that separating

the first from the peripheral sulcus. There is no spiral cord at the insertion of the columella. Aperture decidedly channeled anteriorly; posterior angle obtuse; outer lip thin, rendered wavy at the edge by the external sculpture, which is visible through the substance of the shell; inner lip decidedly sinuous, reflected over and appressed to the columella; parietal wall provided with a thin callus.

The type, Cat. No. 340858, U.S.N.M., was collected by Mrs. Oldroyd at Clayoquot, British Columbia. It has nine and a half post-nuclear whorls and measures, length, 6.5 mm.; diameter 2.3 mm.

I named this species for Dr. C. M. Frazer, Director of the Biological station, Nanaimo, British Columbia.

Another specimen, Cat. No. 340856, U.S.N.M., was collected by Mrs. Oldroyd. It comes from Victoria, British Columbia, and Cat. No. 340857, U.S.M.N., two specimens, were likewise collected by Mrs. Oldroyd at Nanaimo, British Columbia. Additional specimens of this species are in Mrs. Oldroyd's collection.

**CERITHIOPSIS (CERITHIOPSINA) WILLETTI Bartsch**

Plate 5, fig. 1

*Cerithiopsis (Cerithiopsina) willetti* BARTSCH, Proc. Biol. Soc. Wash., vol. 34, 1921, pp. 36-37.

Shell large, robust, elongate-conic, pale brown. All but the last nuclear whorl decollated. This shows, however, that the species belongs to the subgenus *Cerithiopsina*. Postnuclear whorls crossed by very strong, almost sublamellar, rather coarse, rounded, protractively slanting axial ribs, of which 16 occur upon the first to fifth, 18 upon the sixth, 20 upon the seventh, and 24 upon the last turn. Intercostal spaces about two-thirds as wide as the ribs. In addition to the axial ribs there are three strong spiral cords, of which the first is about as far anterior the summit of the whorls as it is distant from its median neighbor. The first of these spiral cords is a little less strongly developed on the earlier whorls than on the succeeding turns, where it almost equals the other two. The junction of the axial ribs and the spiral cords forms strong tubercles, of which those on the cord at the summit are well rounded, while those on the median cord are truncated posteriorly and slope gently anteriorly. The same is true of the suprasutural cord. On the last whorl, however, the tubercles are more elongated and the truncation at the anterior margin is less pronounced, the long axis of the tubercles coinciding with the axis of the shell. The spaces inclosed between the axial ribs and spiral cords are well-rounded pits. The summit of the whorls falls a little anterior to the peripheral cord and lets this appear as a narrow, smooth, sinuous thread in the somewhat constricted suture. Periphery of the last whorl marked by a

strong cord, which constitutes the termination of the axial ribs. Base short and rounded, but concave at the junction with the columella. The junction of the columella and the base is marked by a slender spiral cord. Aperture broadly oval, decidedly channeled anteriorly; posterior angle obtuse; outer lip thin, rendered sinuous by the external sculpture, which is also seen within the aperture by transmitted light; inner lip reflected over and appressed to the columella.

The type, Cat. No. 268746, U.S.N.M., was collected by George Willett at Forrester Island, Alaska. It has nine postnuclear whorls and measures, length, 7.5 mm.; diameter, 2.5 mm. Two specimens from the same collecting are registered as Cat. No. 366216, U.S.N.M. Four additional specimens from the same station are in Mr. Willett's collection. Another specimen, Cat. No. 340936, U.S.N.M., was collected by Mrs. Oldroyd at San Juan Islands.

This species suggests *Cerithiopsis* (*Cerithiopsina*) *signa*, but has much larger nuclear whorls and is in every way more robust than that species.

**CERITHIOPSIS (CERITHIOPSINA) SIGNA** Bartsch

Plate 5, fig. 4

*Cerithiopsis* (*Cerithiopsina*) *signa* BARTSCH, Proc. Biol. Soc. Wash., vol. 34, 1921, p. 36.

Shell elongate-conic, pale brown. First half postnuclear whorl smooth, the next one and a half well rounded and marked by rather distantly spaced, almost vertical axial ribs. Postnuclear whorls appressed at the summit, marked by strong, rounded, almost vertical axial ribs, of which 18 occur upon the first, 14 upon the second to sixth, 16 upon the seventh, and 18 upon the last turn. The spiral sculpture consists of three strong, equally spaced cords, which are crossed by strong axial ribs. The intersection of the axial ribs and the spiral cords form strong tubercles, which are truncated on their posterior margin and slope gently anteriorly in all three groups. The spaces inclosed between the cords and the ribs are elongated pits which have their long axis coinciding with the spiral sculpture. In addition to this the entire surface of the spire is marked by fine axial lines of growth and closely spaced spiral striations. Suture strongly impressed. Periphery of the last whorl rendered angulated by a keel. Base short, slightly concave at the insertion of the columella, marked by fine lines of growth and very fine spiral striations, and a slender spiral thread at the insertion of the columella. Aperture subquadrate; decidedly channeled anteriorly; posterior angle obtuse; outer lip rendered sinuous by the spiral cords; inner lip sigmoid, reflected over and appressed to the columella.

The type, Cat. No. 340826, U.S.N.M., was collected off O'Neal Island, Puget Sound. It has 10.5 whorls and measures, length, 5.5 mm.; diameter, 2.7 mm.

The following additional specimens have been examined: Three specimens, Nanaimo, British Columbia, Cat. No. 340841, U.S.N.M.; four specimens, Port Orchard, Puget Sound, Cat. No. 133233, U.S.N.M.; seven specimens, San Juan Island, Puget Sound, Cat. No. 340934, U.S.N.M.

*CERITHIOPSIS (CERITHIOPSIDELLA) ONEALENSIS* Bartsch

Plate 5, fig. 2

*Cerithiopsis (Cerithiopsidella) onealensis* BARTSCH, Proc. Biol. Soc. Wash., vol. 34, 1921, pp. 35-36.

Shell elongate-conic, pale chestnut brown. Nuclear whorls decolored in the type. In one of the three specimens of this species (Cat. No. 346649, U.S.N.M.), collected by G. Willett at Craig, Alaska, the last two nuclear whorls are present. These show slender, decidedly retractively curved, rather distantly spaced, axial riblets between which many even finer spiral threads are present. Postnuclear whorls moderately rounded, slightly overhanging, crossed by very strong, broad, rounded, slightly protractively slanting axial ribs, of which 16 occur upon the first four turns, 18 upon the fifth, and 26 upon the last. Intercoastal spaces about half as wide as the ribs. In addition to the axial ribs the whorls are crossed by three strong spiral cords, of which the one at the summit is a little less strong than the other two. The junction of the axial ribs and spiral cords forms very prominent tubercles. Those on the cord near the summit are well rounded. Those on the median cord are truncated posteriorly and almost truncated anteriorly, while those on the cord above the suture are abruptly truncated posteriorly and slope moderately, gently anteriorly. On the last whorl, where the ribs are much more crowded, the tubercles have an oblong outline, and are about equal on all three cords, their long axis coinciding with the axis of the shell. The pits inclosed by the spiral cords and axial ribs are well rounded on all the whorls. Suture strongly impressed. Periphery of the last whorl marked by a sulcus about as broad as that separating the median from the supersutural cord on the spire. Base short, well rounded, marked by feeble continuations of the axial ribs, which lend it a roughened aspect, and a single slender spiral thread, which encircles the base at the insertion of the columella. Aperture decidedly channeled anteriorly; posterior angle obtuse; outer lip thin, showing the external sculpture within, sinuous at the edge; inner lip sigmoid, reflected over and appressed to the columella.

The type, Cat. No. 340827, U.S.N.M., was collected by Mrs. Oldroyd in 20 fathoms, off O'Neal Island, Puget Sound. It has almost seven postnuclear whorls and measures, length, 5.1 mm.; diameter 1.9 mm.

We have seen the following additional specimens: Cat. No. 362165, U.S.N.M., six specimens, from Shuyak, Strait, Afognak Island, Alaska, collected by Walter Eyerdam; Cat. No. 342739, U.S.N.M., six specimens, collected by Dr. Carl C. Engberg at Olga, Washington. Nine additional specimens from the same locality are in Doctor Engberg's collection. Cat. No. 346649, U.S.N.M., contains three specimens collected by G. Willett at Craig, Alaska.

**CERITHIOPSIS (CERITHIOPSISIDELLA) FIA, new species**

Plate 5, figs. 6, 7

Shell broadly conic, chestnut-brown. Nuclear whorls decollated excepting a portion of the last turn which has numerous slender distantly spaced, retractively slanting axial threads and numerous fine spiral threads in the intercostal spaces which are placed at right angles to the axial ribs. Postnuclear whorls moderately rounded, marked by almost vertical axial ribs of which 14 occur upon the first and second, 16 upon the third and fourth, 18 upon the fifth and sixth, 20 upon the seventh, and 22 upon the last turn. These ribs are about as wide as the spaces that separate them. In addition to the axial sculpture, the whorls are marked by three strong spiral cords of which the first at the summit is a little weaker than the rest. These cords render their junction with the axial ribs strongly nodulose. The nodules of the cord at the summit are rounded; those of the other two cords are truncated posteriorly and slope gently anteriorly. The pits inclosed between the axial ribs and spiral cords are almost rounded. Periphery marked by a strong spiral cord which is separated from the first supraperipheral cord by a groove about as wide as that separating that cord from the median of the spire. The groove is crossed by the continuations of the axial ribs which extend feebly over the cord and render it weakly tuberculate. Base short, well rounded, marked by four strong spiral cords which grow successively weaker from the posterior anteriorly. These are separated by grooves much narrower than the width of the cords, and they are rendered slightly tuberculated by the slender continuation of the axial ribs. Aperture subquadrate, decidedly channeled anteriorly; posterior angle obtuse; outer lip thin, showing the external sculpture within, rendered sinuous at the edge by the external sculpture; inner lip sigmoid.

The type, Cat. No. 340935 U.S.N.M., was collected by Mrs. T. S. Oldroyd at Monterey Bay, California. It has nine whorls, and

measures, length, 7.4 mm.; diameter, 2.9 mm. Cat. No. 363781, U.S.N.M., contains a younger specimen collected by H. N. Lowe at Laguna, California. We give a figure of this also.

**CERITHIOPSIS (CERITHIOPSIDELLA) SANTACRUZANA, new species**

Plate 5, fig. 3

Shell stout, very broadly conic, pale brown. Early nuclear whorls decollated, the last one and one-half marked by very slender, distantly spaced, decidedly protractively slanting axial riblets, while the broad spaces between them are marked by slender raised threads which are placed at right angles to the axial riblets. Postnuclear whorls moderately rounded, marked by strong, retractively slanting axial ribs. Of these, 16 occur upon the first to fourth, 18 upon the fifth, 20 upon the sixth and seventh, and 22 upon the penultimate turn. The spaces which separate the axial ribs are about as wide as the ribs. In addition to the axial sculpture, the whorls are marked between summit and suture by three strong spiral cords, of which the first, which is at the summit, is a little weaker than the other two on all the turns but the last. The junction of the axial ribs and spiral cords form strong tubercles which are truncated posteriorly and slope more gently anteriorly. The spaces inclosed between them are roundish pits. Suture moderately impressed. Periphery of the last whorl marked by a rather strong cord. The space separating this from the cords of the spire is crossed by the continuation of the axial ribs, which extend to the cord but do not cross it, nor do they tuberculate it. Base short, moderately rounded, marked by a spiral cord which is a little less strong than the one at the periphery from which it is separated by a channel a little narrower than that separating the peripheral cord from the first suprapерipheral. Aperture subquadrate, decidedly channeled anteriorly; posterior angle obtuse; outer lip rendered wavy by the external sculpture; inner lip sigmoid.

The type, Cat. No. 363785 U.S.N.M., comes from Santa Cruz, California. It has 10 whorls and measures, length, 5.9 mm.; diameter, 2 mm.

**ALABA CATALINENSIS Bartsch**

Plate 2, fig. 5

*Alaba catalinensis* BARTSCH, Journ. Wash. Acad. Sci., vol. 10, 1920, No. 20, p. 572.

Shell elongate-conic, milk white, early whorls well rounded, the succeeding turns a little less so. All whorls polished, appressed at the summit, and marked by fine retractively slanting lines of growth. Beginning with the second turn, varicial thickenings make their appearance; these are very feeble on the early whorls, but increase

steadily in strength until on the last turn they form decidedly raised sinuous ridges. The last whorl, too, shows well-marked malleations. Aperture oval; posterior angle obtuse; inner lip curved and reflected, but not appressed to the base; parietal wall covered by a thick callus.

The type, Cat. No. 213369, U.S.N.M., was collected by Dr. S. S. Berry in 40 fathoms, off Catalina Island, California. It has  $10\frac{1}{2}$  whorls and measures, length, 5.3 mm.; diameter, 1.9 mm. It is at once distinguished from the other two West American species by the absence of incised spiral lines.

*AMPHITHALAMUS STEPHENSAE*, new species

Plate 4, fig. 5

Shell minute, pale brown with an ashy tinge except the columellar region which is flesh colored; the early whorls when they contain the animal are much more dusky. Nuclear whorls 1.5; the first half smooth, the rest marked by rather distantly spaced, poorly developed, rather broad spiral lirations of which nine are present between the summit and the periphery. In addition to this, there are inconspicuous lines of growth. Postnuclear whorls strongly rounded, narrowly shouldered at the summit, the portion appressed to the preceding turn appearing through the substance of the shell as a band. Periphery with a weak keel which is truncated rather abruptly posteriorly but grades gently into the substance of the shell toward the base. Suture well marked. Base short, inflated, strongly rounded, marked by lines of growth only. There is a heavy callus at the insertion of the columella, which at its posterior termination almost forms a cord. The columella itself is very heavy and oblique. The conformation of the aperture is characteristically Amphithalmid, that is, the aperture which is oval is much contracted by having a shelf extending out from the columellar and the parietal wall toward the outer lip, contracting the aperture. This shelf forms a decided pit behind its edge. The inner and parietal lip of the aperture, therefore, are not in contact with the columellar or the parietal wall, but at some distance from it; the posterior portion of the outer lip, however, extends upward to the preceding turn, which it joins immediately below the peripheral keel as in mollusks with a normal aperture. Operculum thin, paucispiral.

The type, Cat. No. 348531, U.S.N.M., was collected by Mrs. C. L. Simons in Magdalena Bay, Lower California. It has four whorls, and measures, length, 1.1 mm.; greater diameter, 0.9 mm. Cat. No. 348532, U.S.N.M., contains an additional lot of specimens taken from kelp root in Turtle Bay by Mrs. Simons.

This species differs from the two previously known forms, *Amphithalamus inclusus* Carpenter and *Amphithalamus tenuis* Bartsch in being much stouter than *A. tenuis* Bartsch, and in having coarser spiral threads on the early whorls, a less strong peripheral keel, and more rounded whorls than *A. inclusus* Carpenter.

ALVANEA SANJUANENSIS, new species

Plate 3, fig. 7

Shell moderately large, chestnut brown excepting the tip, which is a little paler and the extreme base which is lighter. Nuclear whorls one and a half, well rounded; the sculpture of the nuclear whorls eroded in all the shells seen except in a very small fraction of the last turn in the type, which presents a finely, somewhat wavy, spirally lirate surface. I am not quite certain whether axial threads are present or not. Postnuclear whorls strongly shouldered at the summit, strongly rounded, marked on the first turn by three strong spiral cords, which occupy the anterior half of the turn; on the second turn a fourth cord occurs a little anterior to the median line between the summit and the first strong cord, while on the next turn a fifth slender thread makes its appearance between the summit and this cord. This last cord at the summit never attains a strength as great as the third anterior to it, while the second one is fully as strong on the penultimate turn. In addition to these spiral cords the shell is marked by rather weak axial ribs, of which 24 occur upon the second, 26 upon the third, and about 32 upon the last turn; on this they are decidedly enfeebled. The junction of the axial ribs and spiral cords forms feeble nodules. The entire surface of the spire between ribs and interspaces is crossed by fine spiral and axial threads which lend it a fine clothlike texture. Suture strongly constricted. Periphery of the last whorl well rounded. Base moderately long, well rounded, marked by seven equally spaced spiral threads, of which the seventh immediately behind the inner lip is very feeble. The rest are almost as wide as the spaces that separate them. The axial ribs do not extend over the base, but the fine sculpture described for the spire is also present here. Aperture ovate; posterior angle obtuse; outer lip thin at the edge, strongly curved; inner lip strongly curved, reflected and appressed to the base except at the extreme tip; parietal wall covered by a thick callus, which renders the peritreme complete.

The type, Cat. No. 334487, U.S.N.M., was collected by Dr. C. C. Engberg at San Juan Island, Gulf of Georgia. It has five whorls and measures, altitude, 3 mm.; diameter, 1.5 mm. Three additional specimens, Cat. No. 363777, U.S.N.M., come from the same gathering.



Eight more specimens from the same station are in Doctor Engberg's collection. Cat. No. 342330, U.S.N.M., contains 16 specimens from Olga, Washington. Sixty more from the same station are in Doctor Engberg's collection. Cat. No. 340865, U.S.N.M., contains 20 from Washington without specific locality.

This species is nearest related to *Alvania montereyensis* Bartsch, but can at once be distinguished from it by its much larger size, as well as other detail characters.

ALVANIA DALLI, new species

Plate 3, fig. 6

Shell small, thin, semitranslucent, bluish white. Nuclear whorls one and one-half, strongly rounded, finely granular. Postnuclear whorls rather inflated, strongly rounded, appressed at the summit, marked by five low, rounded, not quite equal and equally spaced spiral cords, which are about as wide as the spaces that separate them, and numerous, fine lines of growth and microscopic, closely spaced, spiral striations. The incremental lines and fine spiral sculpture give to the surface of the shell a fine clothlike texture. Suture strongly constricted. Periphery of the last whorl inflated, well rounded. Base short, strongly rounded, narrowly umbilicated, marked by 14 spiral cords which become a little less strong and closer spaced anteriorly. In addition to this the base is marked by the fine sculpture referred to on the spire. Aperture subcircular, posterior angle decidedly obtuse; outer lip thin, strongly curved, showing the external sculpture within; columella slender and slightly reflected; parietal wall covered by a thick callus which renders the peritreme complete.

The type, Cat. No. 362154, U.S.N.M., comes from Shuyak Strait, Afognak Island, Alaska. It has four and one-half postnuclear whorls and the nuclear turns and measures, length 2.5 mm., diameter, 1.3 mm.

Cat. No. 362155, U.S.N.M., contains four additional specimens from the type locality, while Walter J. Eyerdam's collection contains nine more.

ALVANIA BURRADENSIS Bartsch

Plate 3, fig. 5

*Alvania burradensis* BARTSCH, Proc. Biol. Soc. Wash., vol. 34, 1921, p. 38.

Shell very broadly ovate, pale yellow. Nuclear whorls decollated in all our specimens. Postnuclear whorls strongly inflated, marked by strong, rather distantly spaced, curved and slightly protractively slanting axial ribs, of which 24 occur upon the next to the last and 22 upon the last turn. In addition to the axial ribs the whorls are crossed by six equal and equally spaced, broad spiral cords, which

render the axial ribs obscurely nodulose at their junction. The spaces separating the spiral cords are a little less wide than the cords. Periphery of the last whorl marked by a sulcus, which is crossed by the continuation of the axial ribs, which extend partly over the base, but evanesce soon after passing the periphery. Base short, strongly rounded, marked by nine equal and equally spaced prominent spiral cords, which are a little wider than the spaces that separate them. Aperture subcircular; posterior angle obtuse; outer lip reinforced by a callus at the edge; inner lip curved and appressed to the base; parietal wall covered by a moderately thick callus.

The type, Cat. No. 340938, U.S.N.M., was collected by Mrs. Oldroyd at Burrard Inlet, British Columbia. It has four whorls remaining and measures, length, 2.2 mm.; diameter, 2 mm. Cat. No. 363778, U.S.N.M., contains two specimens from the same gathering. Five additional specimens from the same station are in the Oldroyd collection.

This species is nearest related to *Alvania rosana* from off Santa Rosa Island. It differs from this by its less acute outline, by having the whorls more rounded, and also in other details of sculpture.

? *RISSEOELLA CALIFORNICA*, new species

Plate 4, fig. 2

Shell small, thin, semitranslucent, bluish white, broadly ovate. Nuclear whorls smooth, scarcely differentiated from the postnuclear turns. Postnuclear whorls very strongly inflated, strongly rounded, marked by rather strong, retractively slanting, incremental lines and very feebly developed, almost obsolete spiral threads. Periphery of the last whorl inflated, strongly rounded. Base short, inflated, strongly rounded, with a rather broad, open umbilicus which is marked at its external termination by an obsolete angle. The sculpture of the base is like that of the spire. Aperture broadly oval, rather expanded at the junction of the basal and outer lips. Posterior angle acute; outer lip thin; inner lip strongly curved and expanded over the parietal wall, thus rendering the peritreme complete; the outside of the inner lip at the umbilicus is marked by strong incremental lines.

The type, Cat. No. 362453, U.S.N.M., was collected by Dr. R. H. Tremper on rocks at San Clemente Island, California. It has 4.2 whorls and measures, length 2.4 mm.; diameter, 1.16 mm.

I am placing this species in the genus *Rissoella* with some doubt, but until I will have seen anatomic material I hesitate to give it a distinct generic designation.

A topotype of this species is in Doctor Tremper's collection.

**MARGARITES (LIRULARIA ?) SMITHI, new species**

Plate 4, figs. 7, 11, 12

Shell minute, rather elevatedly helicoid, white. Nuclear whorls one and a half, well rounded with a carina about one-third of the distance between the summit and the suture, anterior to the summit. Postnuclear whorls well rounded, marked by the continuation of the nuclear carina, which forms a rather strong cord and a slender cord about midway between this and the summit, and two strong cords which divide the space between the carina and the suture into equal spaces. Between these three cords a lesser one is present. From the third cord, which almost marks the periphery on the last whorl, the base curves gently to the rather open umbilicus. The base is marked by spiral cords, which increase steadily in strength from the periphery to the umbilical angle; the last five are very strongly developed. The umbilical wall appears to be free of sculpture, excepting incremental lines. The spire and base of the shell are marked by strong incremental lines, which in crossing the base, form slight riblets between the spiral cords. Aperture, oval; posterior angle, obtuse; outer lip, thin; peristome complete; operculum multispiral, horny.

The type, Cat. No. 340814, U.S.N.M., was collected in 10 fathoms off China Point, Monterey, California, by A. G. Smith. It has 2.1 postnuclear whorls and measures, altitude, 1.6 mm.; greater diameter, 1.7 mm.

**SOLARIORBIS ARNOLDI, new species**

Plate 6, figs. 7, 8, 9

Shell large, lenticular, semitranslucent, bluish white. Nuclear whorls 1.2, well rounded, smooth. Postnuclear whorls moderately rounded, almost appressed at the summit, the first marked by six interrupted lines of pits and two slender spiral striations near the summit. As the whorls progress the pits become more or less fused into incised spiral lines, of which 7 occur upon the second and 24 upon the last whorl. In addition to the spiral sculpture, the whorls are marked by slender, somewhat irregular retractively slanting axial threads. Periphery of the last whorl slightly obtusely angulated. A rather broad band immediately below the periphery is devoid of spiral sculpture. Base broadly openly umbilicated; the posterior half marked by incised spiral lines which leave the elements between them as moderately broad, flattened cords and numerous lines of growth. The latter are a little rougher at the umbilical angle than on the flattened base. The umbilicus shows all the turns within it. Aperture decidedly oblique, oval; posterior angle with a slender sinus; outer lip thin, showing the external sculpture by transmitted

light; inner lip heavy, thickened, curved; parietal wall covered with a rather thick callus that renders the peritreme complete.

The type, Cat. No. 363784, U.S.N.M., was collected by Delos Arnold at San Pedro, California. It has three and one-half whorls and measures, length, 4 mm.; height, 1.8 mm.; greater diameter, 4.3 mm.

**VITRINELLA (DOCOMPHALA) COLUMBIANA, new species**

Plate 6, figs. 1, 2, 3

Shell small, thin, depressed, helicoid, semitranslucent, bluish white. As usual in this group, the outer surface is badly worn and shows only rough eroded incremental lines which are best developed on the last portion of the last whorls where they have a decidedly retractive slant. The whorls are appressed except the last one which shows a narrow channel at the summit near its termination; moderately well rounded; the early whorls are almost flattened on the upper surface, the last one moderately well rounded. Periphery strongly rounded. Base moderately rounded, moderately, broadly, openly umbilicated, with the usual coarse notching on the columellar wall of the umbilicus. Aperture large, oblique, subcircular; peristome almost complete except for a little notch on the parietal wall; outer lip thin; the basal lip becoming thickened toward the columellar portion; the columella itself is very much thickened and slightly reflected.

The type, Cat. No. 340848, U.S.N.M., was collected by Dr. I. S. Oldroyd in Departure Bay, British Columbia. It has lost part of the nuclear whorl but probably had 3.2 turns. It measures, length, 1.5 mm.; greater diameter, 3 mm.; lesser diameter, 2.2 mm.

The present species is nearest related to *Vitrinella (Docomphala) stearnsi* Bartsch, from which it differs by its much narrower umbilicus and more subcircular aperture, also in having the excavation on the umbilical wall much less pronounced.

**VITRINELLA SMITHI, new species**

Plate 4, figs. 6, 8, 9

Shell minute, pale brown. Nuclear whorls one and a half, smooth. Postnuclear whorls two, well rounded, with well-impressed suture, marked by strongly curved lines of growth only. Under surface widely, openly umbilicated, marked by lines of growth only. The last whorl strongly curved. Aperture slightly oblique, subcircular; peristome thin, rendered complete by the thick callus on the parietal wall.

The type, Cat. No. 340813, U.S.N.M., was collected by A. G. Smith at Whites Point, California. It measures, altitude, 0.6 mm.; greater diameter, 1.2 mm.

The present species is nearest related to *Vitrinella oldroydi*, from which it is at once distinguished by its much smaller size.

## CYCLOSTREMELLA CONCORDIA Bartsch

Plate 6, figs. 4, 5, 6

*Cyclostremella concordia* BARTSCH, Journ. Wash. Acad. Sci., vol. 10, 1920, No. 20, p. 572.

Shell very small, planorboid, hyaline, semitransparent. Early whorls eroded in all the specimens seen. The last two whorls curve suddenly to the deeply channeled suture on the upper surface; the rest gradually, evenly rounded. Periphery of the last whorl well rounded. Base openly umbilicated. The entire surface of the spire and base is marked by rather strong, irregularly developed incremental lines and more or less equal and equally spaced, fine spiral lirations. The intersections of these two sculptural elements give to the surface of the shell the characteristic beaded sculpture of the genus. Aperture very broadly ovate, almost subcircular, the narrower portion being at the posterior angle; peristome thin, not reflected; parietal wall covered by a thin callus. Operculum thin, corneous, paucispiral.

The type, Cat. No. 340862, U.S.N.M., was collected by Prof. Carl C. Engberg at Olga, Washington, and measures, altitude, 1 mm.; diameter, 2 mm. Two additional specimens from the same locality are in Professor Engberg's collection. Cat. No. 342327, U.S.N.M., contains two specimens collected at Lisabeula, Washington, by Professor Engberg. Five more specimens from this locality are in the Engberg collection. The Museum also has specimens from Friday Harbor, Washington.

This species has been known from the last-named locality under the names of *Skenia* and *Skeniopsis planorbis* Fabricius.

It is easily distinguished from its nearest neighbor, *Cyclostremella californica* Bartsch, by its smaller size, more robust form and weaker sculpture.

## EXPLANATION OF PLATES

## PLATE 1

- FIG. 1. *Turbonilla (Pyrgolampros) ilfa*.  
2. *Aclis californica*.  
3. *Turbonilla (Strioturbonilla) kincaidii*.  
4. *Turbonilla (Chemnitzia) engbergi*.  
5. *Astyris clementensis*.  
6. *Melanella (Melanella) portlandica*.  
7. *Turbonilla (Ptycheulimela) magdalenensis*.  
8. *Opalia tremperi*.

## PLATE 2

- FIG. 1. *Turbonilla* (*Pyrgolampros*) *shuyakenensis*.  
 2. *Turbonilla* (*Pyrgolampros*) *middendorffi*.  
 3. *Odostomia* (*Salassia*) *oenoa*.  
 4. *Turbonilla* (*Pyrgolampros*) *stelleri*.  
 5. *Alaba catalinensis*.  
 6. *Odostomia* (*Amaura*) *sanjuanensis*.  
 7. *Odostomia* (*Evalea*) *bachia*.  
 8. *Turbonilla* (*Mormula*) *enna*.  
 9. *Turbonilla* (*Mormula*) *clementina*.  
 10. *Turbonilla* (*Mormula*) *clementina*, detail of intercostal sculpture.  
 11. *Turbonilla* (*Pyrgiscus*) *delmontensis*.  
 12. *Turbonilla* (*Pyrgolampros*) *eyerdami*.

## PLATE 3

- FIG. 1. *Odostomia* (*Chrysallida*) *tremperi*.  
 2. *Odostomia* (*Chrysallida*) *clementensis*.  
 3. *Odostomia* (*Chrysallida*) *chacei*.  
 4. *Odostomia* (*Chrysallida*) *catalinensis*.  
 5. *Alvania burrardensis*.  
 6. *Alvania dalli*.  
 7. *Alvania sanjuanensis*.  
 8. *Odostomia* (*Chrysallida*) *fla*.  
 9. *Odostomia* (*Chrysallida*) *era*.  
 10. *Odostomia* (*Chrysallida*) *cumsheuaensis*.

## PLATE 4

- FIG. 1. *Odostomia* (*Evalea*) *eyerdami*.  
 2. ? *Rissoella californica*.  
 3. *Odostomia* (*Evalea*) *whitii*.  
 4. *Odostomia* (*Evalea*) *strongi*.  
 5. *Amphithalamus stephensae*.  
 6. *Vitrinella smithi*.  
 7. *Margarites* (*Lirularia*?) *smithi*.  
 8. *Vitrinella smithi*.  
 9. *Vitrinella smithi*.  
 10. *Odostomia* (*Amaura*) *washingtona*.  
 11. *Margarites* (*Lirularia*?) *smithi*.  
 12. *Margarites* (*Lirularia*?) *smithi*.

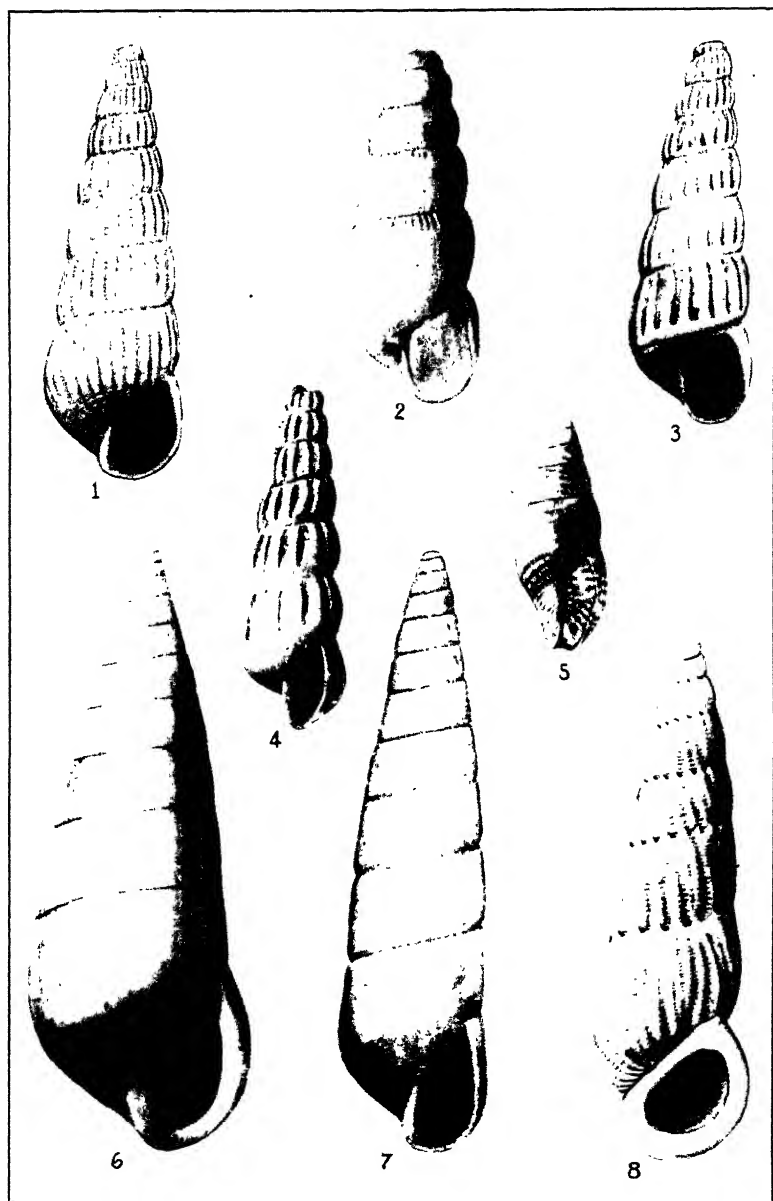
## PLATE 5

- FIG. 1. *Cerithiopsis* (*Cerithiopsisina*) *willetti*.  
 2. *Cerithiopsis* (*Cerithiopsidella*) *onealensis*.  
 3. *Cerithiopsis* (*Cerithiopsidella*) *santacruzana*.  
 4. *Cerithiopsis* (*Cerithiopsisina*) *signa*.  
 5. *Odostomia* (*Amaura*) *engbergi*.  
 6. *Cerithiopsis* (*Cerithiopsidella*) *fla*.  
 7. *Cerithiopsis* (*Cerithiopsidella*) *fla*.  
 8. *Cerithiopsis fraseri*.

## PLATE 6

- FIG. 1. *Vitrinella (Docomphala) columbiana*.  
2. *Vitrinella (Docomphala) columbiana*.  
3. *Vitrinella (Docomphala) columbiana*.  
4. *Cyclostremella concordia*.  
5. *Cyclostremella concordia*.  
6. *Cyclostremella concordia*.  
7. *Solariorbis arnoldi*.  
8. *Solariorbis arnoldi*.  
9. *Solariorbis arnoldi*.

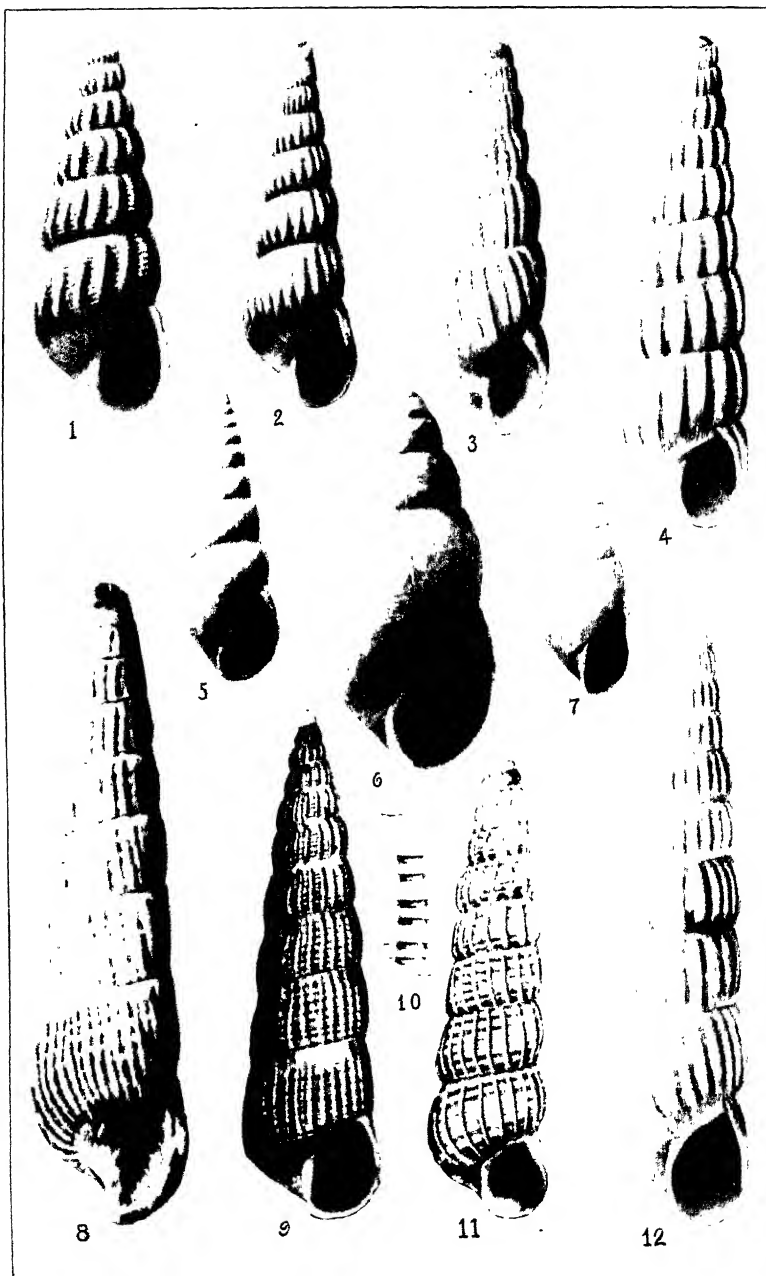




WEST AMERICAN MARINE MOLLUSKS

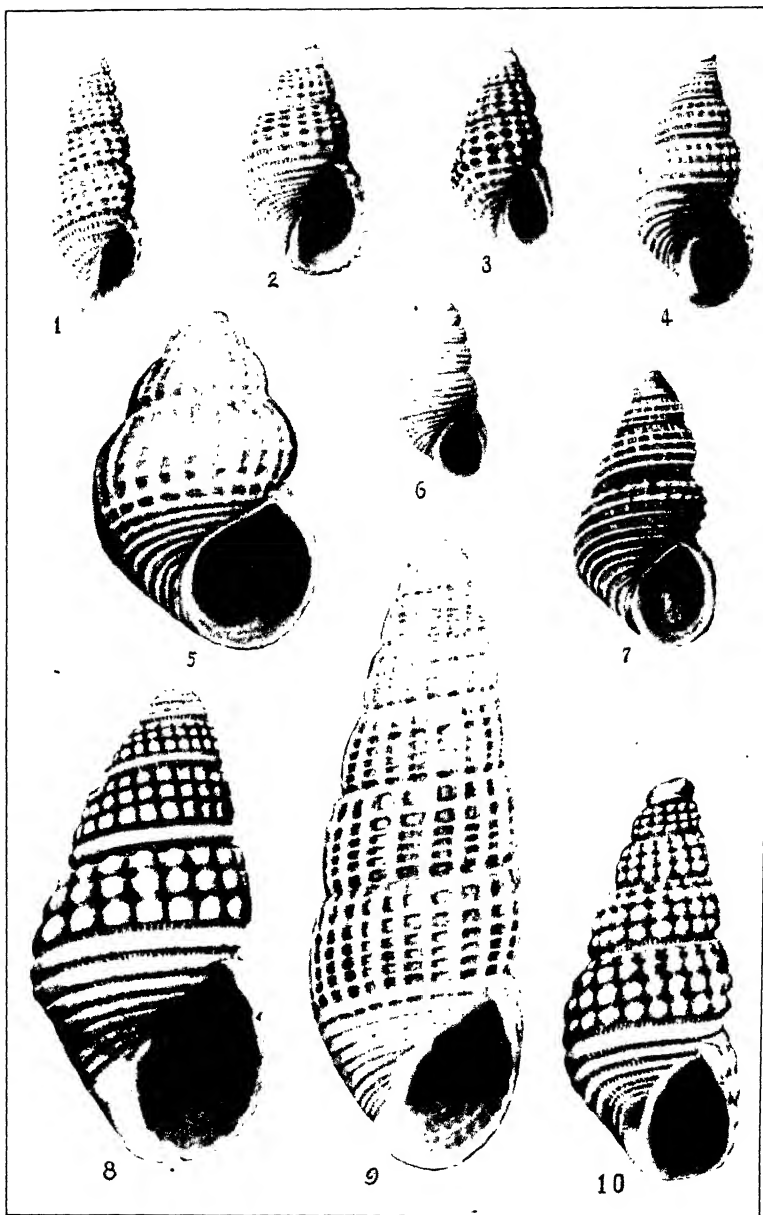
FOR DESCRIPTION OF PLATE SEE PAGE 35





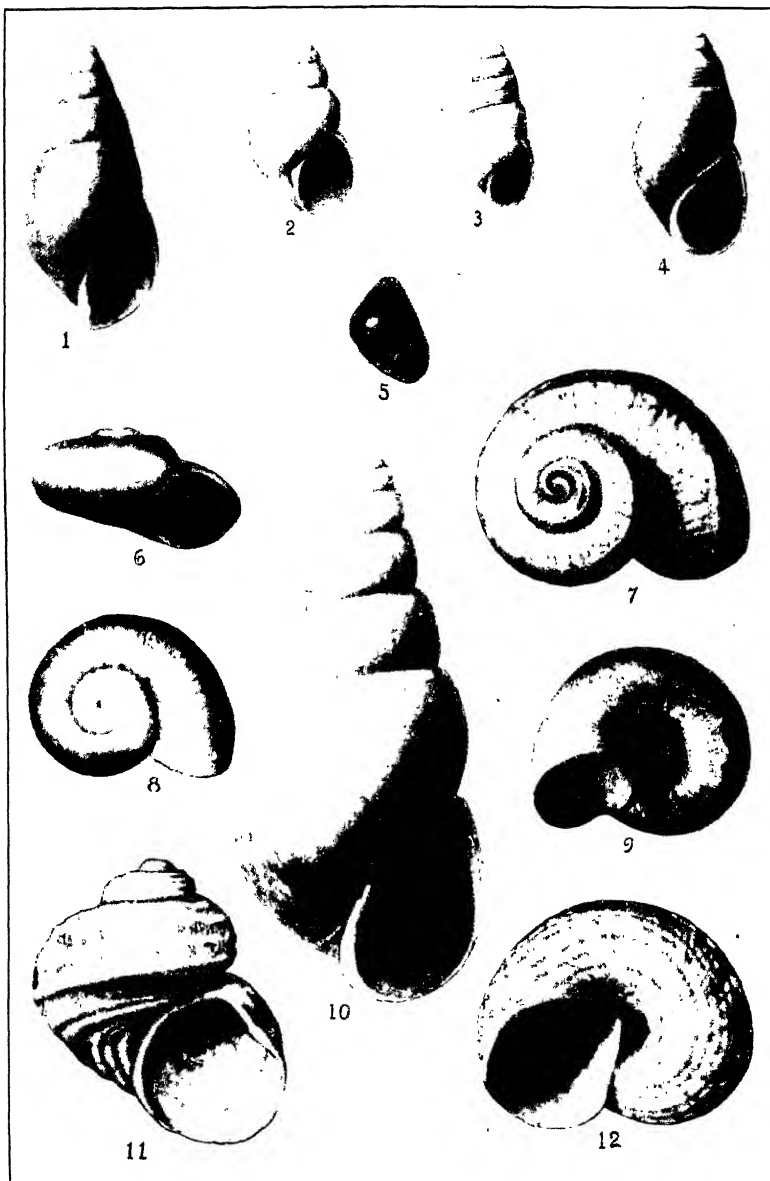
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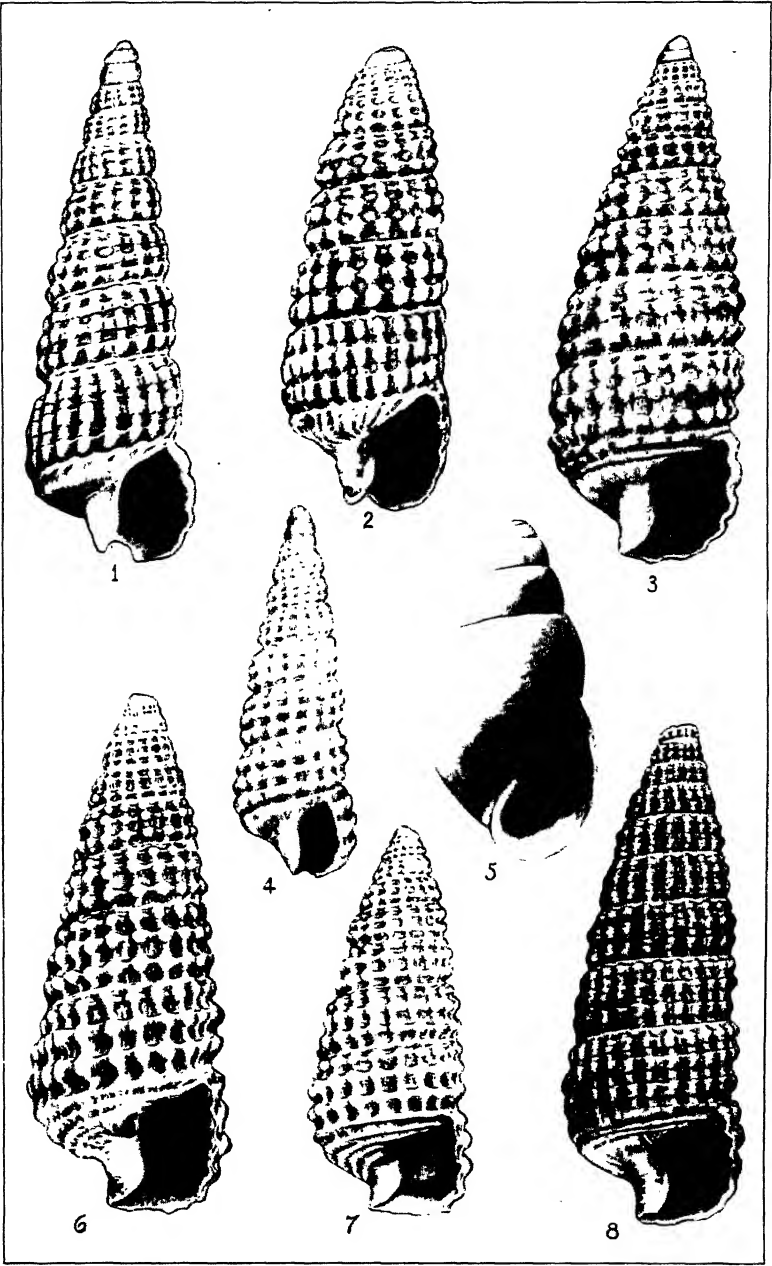
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FOR DESCRIPTION OF PLATE SEE PAGE 38



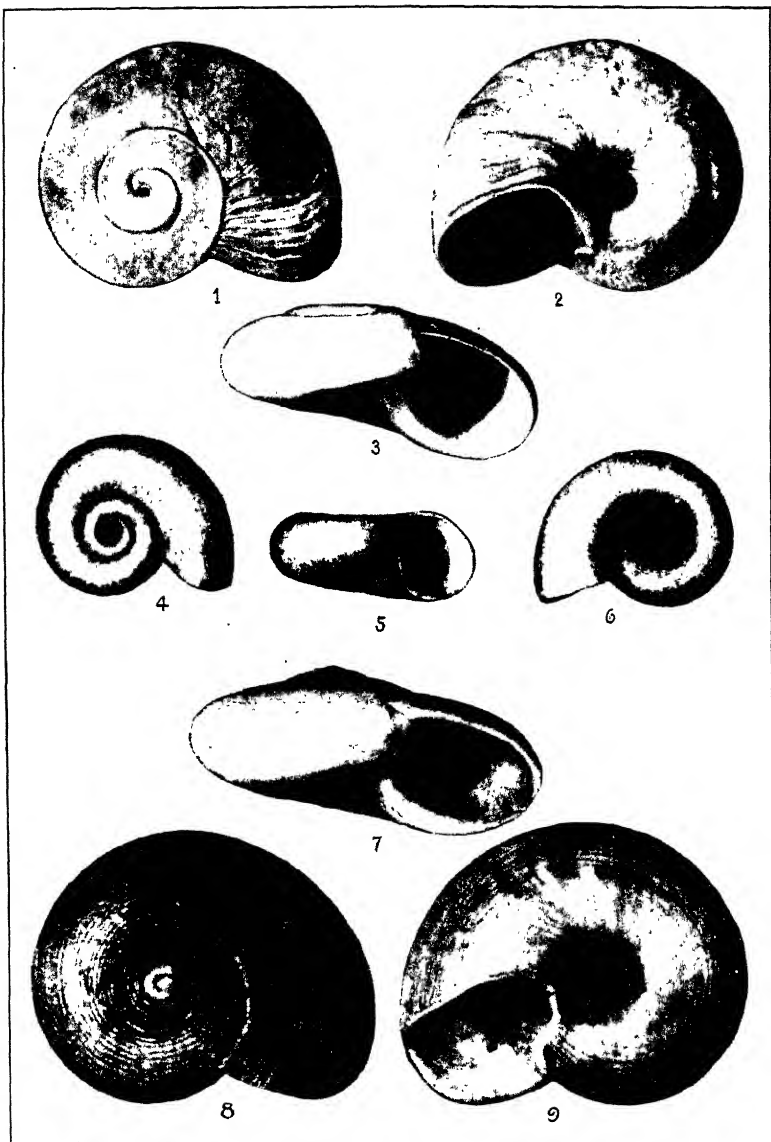
WEST AMERICAN MARINE MOLLUSKS

FOR DESCRIPTION OF PLATE SEE PAGE 36



WEST AMERICAN MARINE MOLLUSKS

FOR DESCRIPTION OF PLATE SEE PAGE 38



WEST AMERICAN MARINE MOLLUSKS

FOR DESCRIPTION OF PLATE SEE PAGE 37

# TANAODON, A NEW MOLLUSCAN GENUS FROM THE MIDDLE DEVONIAN OF CHINA

BY EDWIN KIRK,  
*Of the United States Geological Survey*

In 1915 Prof. George D. Louderback of the University of California made extensive collections of fossils in the interior of China. Through the kindness of Professor Louderback I have had an opportunity to study the post-Cambrian and pre-Carboniferous collections made at that time. Recently having occasion to study *Megalomus* and related genera, in connection with an allied genus from Alaska, I prepared specimens of a Chinese Devonian form, which, while referable to the Megalodontidae, proves to be distinct from any genus hitherto described. The genus is here described under the name *Tanaodon* with *Tanaodon louderbacki*, new species, as the genotype. The generic name is given in reference to the long and well-developed teeth characteristic of the genus.

## TANAODON, new genus

*Tanaodon*, as represented by the individuals of the single species, is a pelecypod of medium size. The largest individual seen has a maximum length of 8 cm., a maximum height of 3.8 cm. and a maximum breadth of 3.8 cm. The shell is thick. In a medium sized individual the shell just posterior to the hinge plate has a thickness of 9 mm. The line marked by the angular shoulder on the exterior is the line of greatest thickness. From this line the shell thins toward the margins but at all times is heavy. The surface is marked by strong concentric growth lines. These become more pronounced with age and are particularly strong on the dorsal surface. The lunule is small and scarcely differentiated. There is a poorly defined escutcheon.

The shell is elongate subrhomboidal. The greatest dimension is in the line connecting the beak with the posterior margin. The line is marked by a strongly developed angular shoulder. In the type species the length is fully twice the height of the shell. The hinge

line is long and gently arcuate, being about two-thirds the length of the shell. The anterior margin is short, being about one-half the length of the hinge. The margin is nearly straight for about one-half its length and then curves backward to meet the ventral margin.

*Tanaodon* is referable to the family Megalodontidae. It seems most closely related to a new genus from the upper Silurian of Alaska, the two standing apart from either *Megalomus* or *Megalodon*. From the Alaskan genus *Tanaodon* differs in the larger anterior muscle, the smaller opisthodontic ligament, the great development of lateral teeth, and in its general form and contours. In its general form *Tanaodon* bears a close resemblance to the Cyrtodontidae.

The greatest dimension of the shell is in the diagonal line connecting the umbones with the posterior margin. This line is marked on the exterior by a pronounced angular shoulder. The hinge line is long and the anterior margin short, giving the shell a long narrow obliquely inclined outline, viewed from the side. The umbonal area is highly arched and the beaks prominent. They are incurved toward the anterior end of the shell. The umbonal ridge noted above is almost carinate in the anterior portion and persists as a strongly marked angular shoulder to the posterior margin. From this ridge the shell drops off abruptly to the dorsal margin and more gradually in the other directions.

The hinge plate is wide and massive. In the prepared specimen of the type species there are eight well-defined cardinal teeth. These are arranged fanwise, the tooth lying nearest the anterior margin being subparallel to it and the one farthest removed being subparallel to the dorsal margin. This group of cardinal teeth is followed by a series of posterior lateral teeth. In the type species the latter are three in number and are unusually long and massive. The passage from cardinal to lateral teeth is so gradual that a division into two groups must be an arbitrary one. The adjacent teeth of the two groups overlap and lie parallel, the tooth chosen as the first lateral having its inception far forward near the anterior margin.

There is a large, well-defined parivincular opisthodontic ligament which extends from the beak backward for about one-half the length of the hinge plate. The hinge plate is grooved for the reception of the ligament, giving the latter a lenticular cross-section. The posterior muscle scar has not been seen. The anterior muscle is large. The scar is situated directly beneath the group of cardinal teeth and lies on a built-up platform. The pallial line is simple so far as seen. No pedal scar seems to be present.

**TANAODON LOUDERBACKI, new species**

This, the type and only known species of the new genus *Tanaodon*, was collected by Prof. George D. Louderback in the Middle Devonian

deposits of the Tung Kou District, Szechwan, China. Seven specimens are available for study. The preservation is excellent. The specimens are as a rule somewhat crushed, but the ones chosen for illustration are relatively free from distortion.

The specimen used for measurement and description is the smallest in the lot. Its maximum length, measuring from the beaks to the posterior margin, is 7 cm. The maximum height is 3.25 cm. and the maximum breadth 3.4 cm. The largest specimen gives the following measurements: Length, 8.2 cm.; height, 3.6 cm.; and breadth (somewhat compressed), 3.7 cm.

The shell is thick, as in the other genera of the Megalodontidae. In a medium-sized individual the shell has a thickness of 9 mm. near the umbones and posterior to the hinge plate. The shell is heaviest along the line corresponding to the angular shoulder on the exterior. From this line of maximum thickness the shell thins gradually to the margins. The surface is marked by strongly developed irregular concentric growth lines. These are especially well developed on the dorsal surface and in the posterior portion of the shell. The lunule is small and inconspicuous. There is a poorly defined escutcheon, which consists merely of a somewhat flattened area without definite boundaries on the posterior side.

The shell is subrhomboidal in outline, and as indicated by the measurements and figures is long and low. The hinge line is about two-thirds the length of the shell and is gently arcuate. The anterior margin is short and forms an acute angle with the hinge. In the type specimen the anterior shell margin incurves abruptly just below the beaks, forming a narrow deep pit. This pit is lacking in other specimens. The posterior margin is sharply curved. The ventral margin is almost straight or slightly sinuous, curving upward at the ends to meet the anterior and posterior margins. The greatest dimension of the shell is the line running obliquely from the beaks to the posterior margin. The beaks are sharply differentiated and large. They come almost into contact in the anterior portion and curve forward. The umbonal ridge in the anterior portion of the shell is developed as a sharp keel. Posteriorly the ridge is more rounded but persists as a strongly developed angular shoulder. From this ridge the shell drops abruptly to the dorsal margin. To the posterior and ventral margins the shell curves gently, while to the anterior margin there is a steep pitch amounting to incurvature in some individuals.

The hinge plate is wide and heavy. Along the dorsal margin it is gently arcuate, following the contour of the shell margin. In the specimen prepared to show the internal structures there are eight well-developed cardinal teeth. The tooth nearest the dorsal side might with almost equal propriety be classed as a lateral, as there is



a gradual and almost perfect gradation between cardinals and laterals in this species. The teeth are long and heavy, having a fanlike arrangement which makes the anterior tooth lie subparallel to the anterior margin, while the tooth farthest removed lies parallel to the laterals and the dorsal margin. There are three very long heavy lateral teeth. The first has its inception near the anterior end of the cardinals. The second overlaps the first, while the third, beginning still nearer the posterior end of the shell does not reach as far as the second. Above the group of heavy laterals is a short incipient tooth showing as an obscure ridge. In its anterior half the hinge plate is deeply grooved for the reception of the ligament.

The posterior muscle scar has not been seen. The anterior muscle scar lies on a platform just below the group of cardinal teeth. The scar is large, measuring 8 mm. across in a specimen of average size. The scar proper is somewhat depressed, being bounded on the dorsal, ventral, and anterior margins by a ridge. There appears to be no pedal scar. The pallial line is probably simple.

As noted above, this species was found in the Middle Devonian of the Tung Kou District, Szechwan, China, by Professor Louderback. The type specimens are in the collections of the United States National Museum.

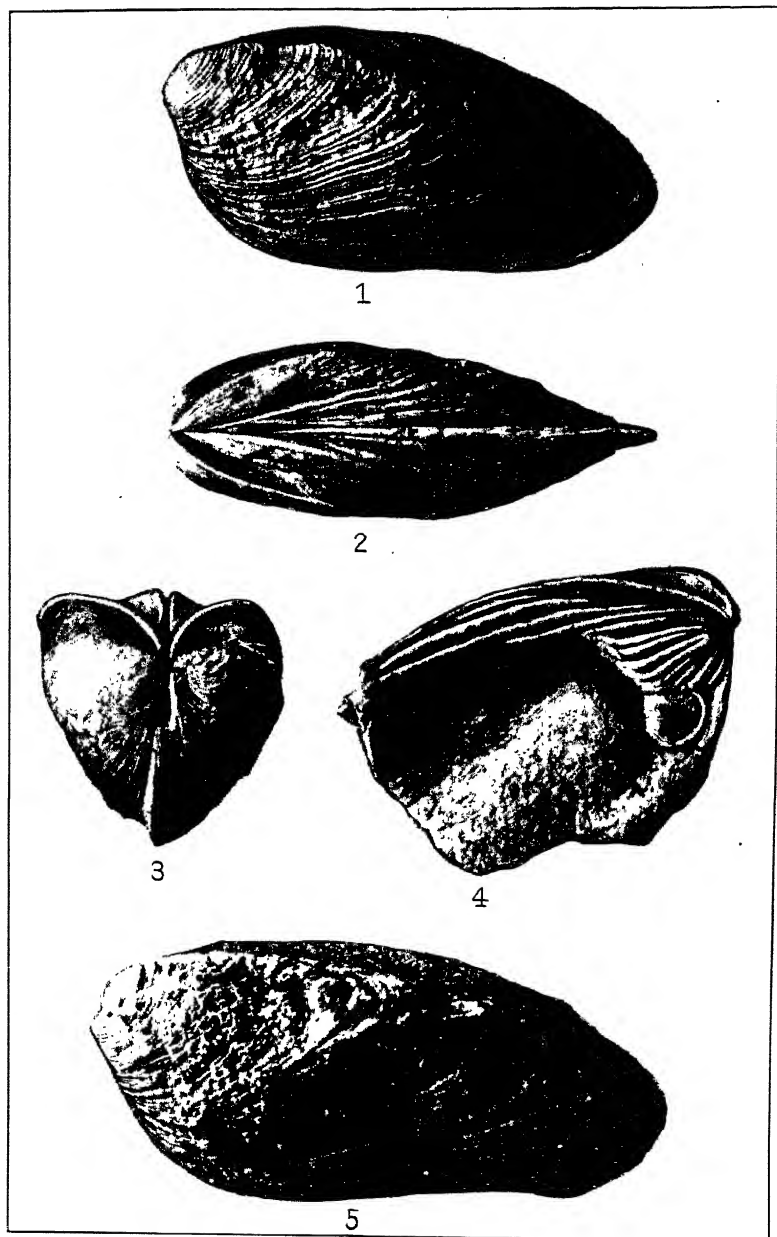
*Cotypes*.—Cat. No. 71070, U.S.N.M.

#### EXPLANATION OF PLATE

*Tanaodon louderbacki*, new species

Figs. 1, 2. Left valve and dorsal view of an individual of medium size. 3, 5. Anterior view and left valve of a large individual. 4. Interior view of left valve of another specimen, showing the hinge plate, teeth, and anterior muscle scar.





TANAODON, A NEW MOLLUSCAN GENUS FROM CHINA

FOR EXPLANATION OF PLATE SEE PAGE 4



# CONTRIBUTION TO THE ANATOMY OF THE CHINESE FINLESS PORPOISE, *NEOMERIS PHOCAENOIDES*

By A. BRAZIER HOWELL

*Of the Bureau of Biological Survey, United States Department of Agriculture*

## INTRODUCTION

Among the spirit specimens of mammals in the United States National Museum are several of the Chinese black finless porpoise, *Neomeris phocaenoides* (Cuvier), which were presented to the Museum by the National Geographic Society in collections made by F. R. Wulsin. Certain osteological features of one of these porpoises were investigated by Remington Kellogg in connection with another problem and his dissections indicated that unless some immediate use were made of these specimens they would soon be worthless for any studies of the soft parts. The matter was brought to the attention of Gerrit S. Miller, jr., and he generously permitted the writer to make whatever disposition of the material might seem to him best. It was at first thought that the preservation was too poor to permit of a dissection sufficiently accurate to be of great value, but it was later found that although the condition was far from satisfactory and such as to preclude fine work, observations of decided interest were nevertheless being made upon the first specimen which was being somewhat hastily examined, and in consideration both of the rarity of this porpoise in the collections of the world and the place in the research program of the writer of the investigation of aquatic adaptations, it was decided that these should be presented in print. A more careful and detailed dissection of a second specimen was accordingly undertaken by the author, and upon this the present contribution is based.

The lot of spirit specimens under consideration had been slit from the vent to the throat and immersed in alcohol which had failed to penetrate sufficiently for proper preservation. Before the arrest of decomposition the deeper portions of the larger muscle masses had become putrid, and when cut into the coarser fibers separated at a touch,

so that the technique of dissection was necessarily very bad. It can not be claimed that every one of the smaller muscles was differentiated. When a point was at all doubtful, however, mention is made of the fact, and by working carefully and noting the direction of the fibers, it is felt that even when the muscles were in too bad a state to be properly handled the results of the dissection are sufficiently accurate for all practical purposes. It seems needless to say that the dissection of material in such a state of preservation should rarely be attempted, but cetacean material that is suitable for myological study so seldom comes to hand that advantage should be taken of every opportunity.

An adequately thorough investigation of specialization for an aquatic existence among the Mammalia calls for a study of the anatomy of representatives of a number of orders. On account of the present lack of desired material, however, and because it is unlikely that this can be secured in the immediate future, the present contribution will be offered separately and without discussion.

#### HISTORICAL

The latest paper of any length dealing with *Neomeris* is that of Glover M. Allen (1923). In this its generic and specific history is clearly and adequately presented, so that further discussion of this item would constitute mere repetition. Allen employs, however, the generic name *Meomeris*, which Thomas (1925) has discarded in favor of *Neomeris*, an action entirely in accord with the opinion of the present writer.

#### MATERIAL

Exclusive of those in the United States National Museum there are evidently no more than a dozen specimens of this porpoise preserved in the institutions of the world, and several of these are fragmentary and undoubtedly in a very poor state of preservation. The National Museum material, however, is more comprehensive than all the remainder combined. This material is as follows:

##### Alcoholics:

240862,<sup>1</sup> im. female. Woosung, Kiangsu, China. May 24, 1924. F. R. Wulsin.

240863, juv. female. Woosung, Kiangsu, China. Mar. 20, 1924. F. R. Wulsin.

240866, im. female. Woosung, Kiangsu, China. May, 1924. F. R. Wulsin.

240864, im. female. Yangtze, Kiangsu, China. Mar. 26, 1924. F. R. Wulsin.

240865, ad. female. Whangpoo Cr., Kiangsu, China. April, 1924. F. R. Wulsin.

239611, juv. male. Yochow, Hunan, China. May 20, 1923. C. M. Hoy.

**Skeletons:**

49544, sex (?). No history.

240862,<sup>1</sup> im. female. Woosung, Kiangsu, China. May, 1924. F. R. Wulsin.

240001, sex (?). Woosung, Kiangsu, China. May 5, 1923. F. R. Wulsin.

240002, sex (?). Woosung, Kiangsu, China. May 5, 1923. F. R. Wulsin.

240002, sex (?). Woosung, Kiangsu, China. April 25, 1923. F. R. Wulsin.

240003, sex (?). Woosung, Kiangsu, China. April 10, 1923. F. R. Wulsin.

239990, sex (?). Hokudo, Zenra Prov., Korea. June 20, 1923. Doctor Ishikawa.

For the present study there have thus been available 11 specimens.<sup>1</sup> Those collected by F. R. Wulsin were gifts to the Museum from the National Geographic Central China Expedition, and the individual secured by C. M. Hoy was obtained during the Chinese expedition sent out by Dr. W. L. Abbott.

The myological portion of the present contribution is based upon the dissection of two of the immature females, which apparently were fully developed sexually but were smaller than any other cleaned skeleton available. Number 240864 was the first one dissected, and the parts in the worst condition were passed over with but cursory attention. Number 240862 was the one next investigated.

**EXTERNAL FEATURES**

*Measurements.*—For the reasons that Allen (pp. 244-245) has already given such a detailed list of external measurements of one of the specimens which he investigated, and that these are deemed to be of slight value when taken from specimens that have been preserved and varyingly distorted, but few measurements are here presented (in millimeters).

	240865	240864	240862	240863
Length to fluke notch.....	1,348	948	964	600
Circumference of peduncle.....	158	127	132	96
Width of flukes.....	392	255	270	150
Length of right flipper from axilla.....	219	133	172	110
Width across mouth.....	98	87	82	60

*Color.*—Observations concerning the color of alcoholic material may be of little value. Be that as it may, the adult female before me is very dark sooty, almost black, as is the Wulsin juvenile, and these two are uniformly of a single shade. All of the remaining specimens, on the contrary, are considerably lighter, the hide being suggestive in color and appearance of a piece of boiled liver, but smoother. Especially when dry the underparts of these immatures are definitely lighter than the more dorsal area, the dividing line,

<sup>1</sup> Number 240862, as an alcoholic, was dissected and the skeleton then cleaned.

which is indistinct, extending from the vicinity of the eye to about 25 mm. above the flipper, and then running in a straight line to a point midway between the anus and the lateral base of the flukes. The hide appears glossy when wet and dull when dry, and is very thin and probably pliable, although naturally it is hardened by the action of the preservative.

*General form.*—Reference to Figure 1 (drawn with the aid of a Wollaston prism and then corrected for symmetry) will give a better idea of the general form than can a printed description. The bulge of the forehead lends an appearance of anterior heaviness to the body, and there is no depression in the vicinity of the neck, although such may be present in the preserved animal, due to a cramped position after death.

*Head.*—The lips are rounded and horny, and the whole anterior part of the head, save posterior to the corners of the mouth and at the apex of the frontal prominence, is tough and elastic to the touch, something like a well-inflated pneumatic tire. Even the corners of the mouth are sufficiently hard to cause one to wonder how free movement of the lower jaw is possible, as of course must be the case. There is a slight depression which appears posterior to the chin when the mouth is open.

The eye is very small, the distance between the canthi of an immature measuring but 12 mm., and the eyeball is set flush with the surface of the cheek. The eyes are open in the preserved specimens, and yet the upper and lower lids are unwrinkled, as it seems they should be were they fully functional. In addition, the tissue about the eye is so fibrous that it is obvious that the mobility of this region is impaired to an indeterminate extent.

The subdermal portion of the external auditory tube is indicated by a slight depression or dimple in the integument, which in the last animal dissected was 111 mm. posterior to the angle of the mouth, a line extending between these two points running just below the eye. The external opening is minute, but the auditory tube broadens subdermally and is curved as indicated in Figure 11.

The apex of the frontal prominence yields more readily to manual pressure than do other portions of the head because of the presence beneath this spot of a deposit of soft fat. The blowhole is situated a trifle caudad of a line running directly vertical through the eye. It is 22 mm. in transverse measurement and slightly crescentic, the concave aspect facing craniad. The edges are lightly rounded.

*Anterior limb.*—The flipper or anterior limb varies considerably in relative size. Thus in the adult female the right flipper was 16 per cent of the total length, in one of the immatures dissected, 14 per cent; and in the other immature investigated and the Wulsin

juvenile, 18 per cent. The proportions, however, were very similar in all the animals. The anterior margin of the flipper is evenly curved, while the posterior margin is "wavy," the border projecting

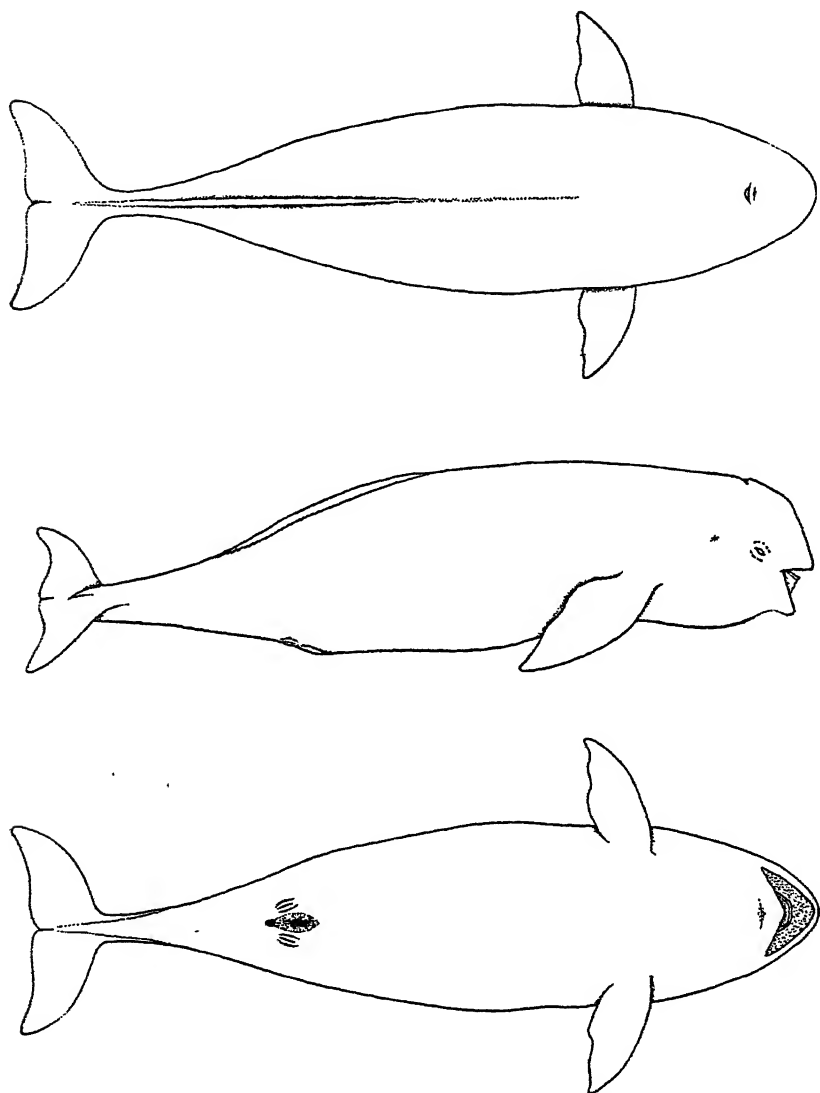


FIG. 1.—EXTERNAL ASPECT OF NEOMERIS. UPPER, DORSAL VIEW; MIDDLE, LATERAL VIEW OF RIGHT SIDE; LOWER, VENTRAL VIEW

somewhat near the extremity of each digit and receding between these points.

*Dorsal ridge.*—The anterior extremity of the dorsal ridge rises very gradually, becoming distinguishable at a point about midway

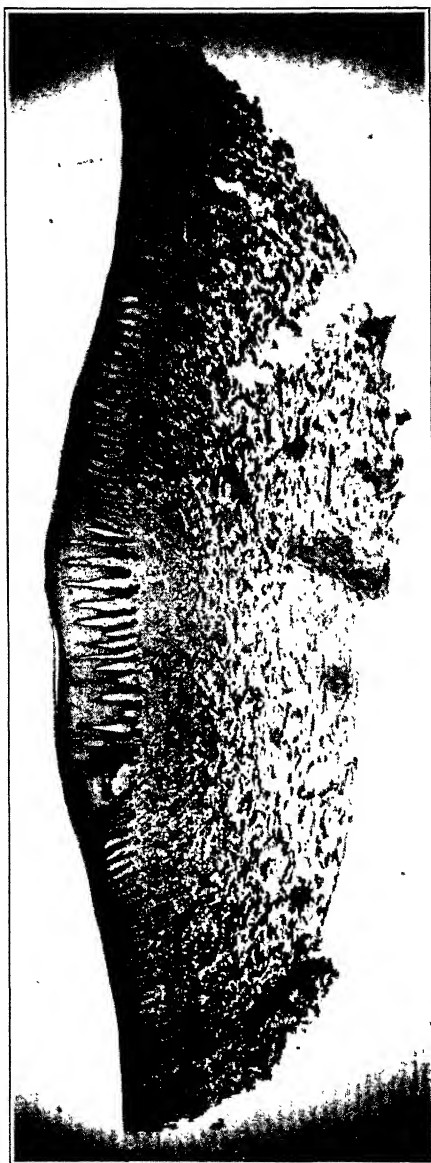


of the dorsum. In the adult female it reaches a height of about 23 mm., and 19 mm. in the immatures; but this measurement is impossible to take with precision. It then disappears as a true ridge at a point from two-fifths to one-half the distance from the anus to the flukes. In the Wulsin juvenile there is only a slight middorsal projection, the lateral boundaries of the future ridge being indicated by a clearly defined groove upon either side, these being 18 mm. apart at greatest divergence and meeting craniad and caudad.

The middorsal line of all save the adult and the juvenal female is appreciably lighter directly dorsad of the axillary region. This lighter line then increases in width and distinctness until, within a distance of less than 100 mm., it is seen to be compounded of three lines of dots, each line staggered in relation to the one next adjoining. The dots are of a much paler shade than the surrounding integument and they have a composite width of as much as 4 mm. At a point about 400 mm. craniad of the fluke notch (in the immatures) they project from the ridge barely sufficiently to be seen and felt as a roughness, but all external evidence, both ocular and tactile, of these disappears at about 250 mm. from the fluke notch. In the adult female and the Wulsin juvenile, however, the dots are apparently absent, while in the Hoy juvenile they are more in evidence than in the older females.

Microscopical examination of a section of the integument cut from the dorsal ridge of the last-mentioned specimen shows that these dots are purely superficial. Kükenthal (1889-1893, 1891) advances the hypothesis that they constitute a vestige of dermal armature. This can not be flatly denied, but there is no reason why these structures should be so considered. Additional microscopical examination of sections of the dorsal ridge prepared at the Johns Hopkins Medical School through the kindness of Dr. Lewis H. Weed and stained with haematoxyline and eosin seems to be conclusive. In these (Plate 1) it is seen that the dots are but a local thickening of the epidermis, evidently colorless in contrast to the surrounding surface. It will be noted that the epidermis of the latter is very thin, the dermal papillae greatly lengthened, and that the latter become coarser and larger beneath the epidermal dots. There is most certainly no sign of cartilage present, much less a center of ossification, and it is hardly possible that they could represent a decadent development from such a condition.

*Flukes.*—In one of the females dissected the peduncle was 24 mm. wide at the narrowest point and 57 mm. in height. The dorsal border of the peduncle is sharper or more acute than is the ventral border. The flukes are symmetrically placed and their width varies from 27 and 28.6 per cent of the total length of the immatures to 29



ENLARGEMENT OF SECTION THROUGH EPIDERMAL DOT OF THE DORSAL RIDGE OF NEOMERIS



per cent in the adult female. The notch between the flukes of the former is deep and narrow, the sides in fact overlapping; but in the adult the notch is much broader and relatively not so deep.

*Genitalia.*—In lateral profile the position of the vulva is indicated by a slight though definite prominence, and the position of the anus by another that is barely apparent. There is a pair of labia, which are hardened in the preserved specimens, and not approximated. Between them lies the vulva, the external features of which are of generous size, but there is no clitoris to be seen. Caudad is situated the much smaller anal opening.

*Mammæ.*—Upon either side and barely caudad of the vulval orifice, as indicated in Figure 1, is a mammary silt, barely raised above the surrounding surface. The borders are lightly marked by depressions.

#### OSTEOLOGY

Allan's descriptions and comparisons of the skeleton of *Neomeris* with that of *Phocaena* are adequate, and a repetition of the information which he presents is hardly desirable; but supplementary and additional details are herewith offered.

As is to be expected, the skulls exhibit endless variation of a somewhat minor nature, especially in the development of the intermaxillary prominences, the region about the external nares, and the rostrum. Caudad, the middorsal sulcus of the rostra of two specimens, is slightly curved, the convex portion facing to the right in 240001 and to the left in 240003. The right side of the skull, from the dorsal aspect, is invariably a trifle larger than the left, as shown by the accompanying measurements. These are taken transversely from the dorso-caudal termination of the mesethmoid to the lateral border of the maxilla of either side. In the cleaned skulls the two narial apertures are practically the same size. As mentioned in the discussion of the blowhole, there is a fossa, filled by a corresponding dilation of the adjoining spiracle, upon the medial portion of the maxilla immediately latero-caudad of the narial opening, and that of the right side is distinctly larger than of the left, save in 49544, in which the two are similar. The vertex of this specimen exhibits the least cranial projection, and as the largest fenestrations of the exoccipitals (save in the immature female dissected and cleaned) are also present in this skull, which is considerably the largest, it is likely that it is a male, while the remaining skeletons are of females.

Upon the ventral aspect of the skull there is variation in the conformation of the border of the palate and the adjoining portion of the pterygoids. There is also variation in the distance that the

falcate processes extend ventrad of the floor of the basioccipital, and apparently infinite variety in the development and shape of the lateral border of the exoccipital. The most important detail of this variation, from a functional standpoint, is the distance from the condyle to the lateral border of the exoccipital, the difference exhibited being as great as 20 mm., thus altering by just this degree the leverage of the attached muscles. Worthy of note is the smoothness of the occipital region as a whole and the large capacity of the brain case. There is a great variation in the intercondyloid portion of the basioccipital, as in 240003 this measures 8.5 mm., and in

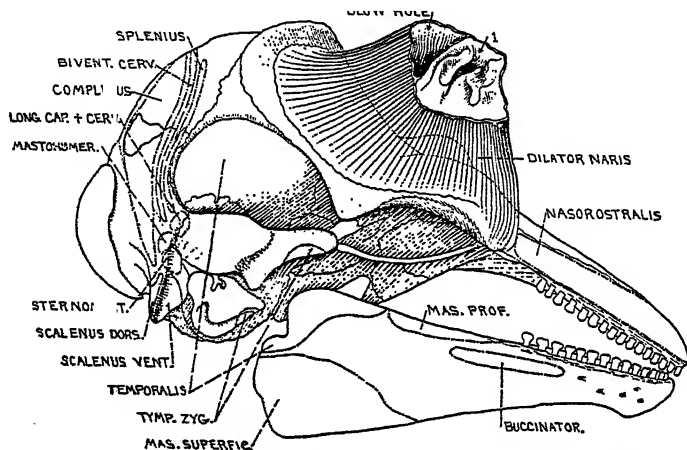


FIG. 2.—LATERAL ASPECT OF RIGHT SIDE OF THE SKULL OF NEOMERIS, SHOWING PARTIAL DISSECTION OF SUPERFICIAL RESPIRATORY SAC (ARROW 1 POINTING TO ITS PASSAGE OF COMMUNICATION WITH THE BLOWHOLE); THE SECOND LAYER OF SPIRACULAR MUSCULATURE; AND ATTACHMENTS OF THE MUSCLES TO THIS PART OF THE SKULL

240002, 20 mm. in width; but in these two specimens the total condyloid width is approximately equal. The bone of the more central portion of the basioccipital is so thin that in 240001 and 240003, and to a lesser extent in 240002, there are extensive vacuities here.

*Measurements of cranial details (in millimeters)*

Detail of skull	239990	240001	240002	240003	240862	49544
Total length of skull.....	220	208	222	213	188	227
Greatest height.....	104	97	99	98	99	113
Greatest width.....	141	142	144	141	129	155
Width of rostrum at anteorbital notch.....	71	66	65	64	56	78
Middle mesethmoid to border right maxilla.....	63	64	67	62	60	69
Middle mesethmoid to border left maxilla.....	55	56	60	55	57	63

*Mandible.*—There is noteworthy variation of the mandible only in the height and shape of the coronoid processes. The two sides of the lower jaw of 240002 exhibit asymmetry rostrad. Between the twelfth and thirteenth teeth the height of the left side is 20, but of the right only 16.6 mm. Accompanying this state of affairs, and very likely having caused it, is a perforation of the lateral aspect of this portion of the jaw, now continuous with the dental canal, and probably indicating a former abscess at this point. It should also be noted that in this specimen the superior portion of the symphysis menti is indented or partially cleft, and within the angle so formed there are two small teeth upon the right side and one on the left.

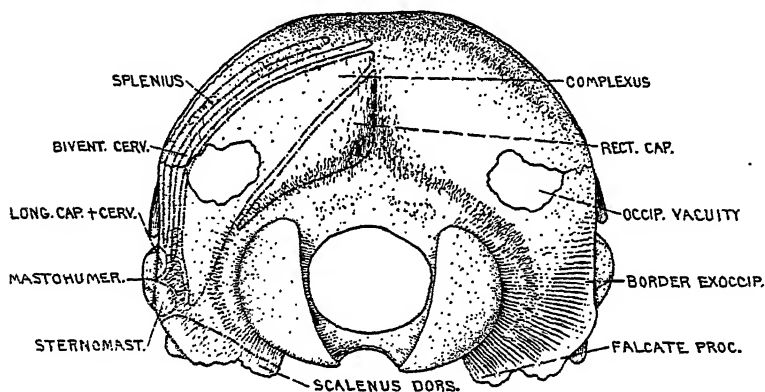


FIG. 3.—POSTERIOR ASPECT OF THE SKULL, SHOWING POSITION OF MUSCLE ATTACHMENTS

This condition may very likely prove of significance in a study of the dentition of the toothed whales.

*Teeth.*—The number of the teeth in *Neomeris* is unstable and too variable to be of much diagnostic value. Either tooth row of the maxillary series may vary from 16 to 21 in number, and of the mandibular from 15 to 20. My figures are essentially in accord with those of Allen, save that in two of my skulls the right mandibular series numbers 20 teeth in one and 21 in the other, while in the individuals examined by him the greatest number in either side of the lower jaw was 19. The youngest skull of the present series has the largest number of teeth, and because of the crowded condition they overlap shingle-wise.

#### HYOID

The hyoid complex exhibits the form shown in figure 4 and consists of five bones. As herein termed, these comprise the body or basihyal; the two ceratohyals attached upon the anterior portion of the body; and in further sequence the two stylohyals. There is con-

siderable variation in the precise shape of the basihyal, which, in the older specimens at hand, has a spread of from 85 to 98 mm. There is equally great variation in the length of the ceratohyals, and in two specimens the left one of this pair is definitely the longer. The stylohyals are about four times as long as these, and their terminal portions fit into depressions upon the border of the exoccipitals.

At roughly 20 mm. from the distal end of the stylohyals is a considerable thickening of the bone which might at first glance be considered to have resulted from muscle stress. Reference to No. 240001 indicates, however, that such is not the case, for this portion of both bones is "staggered" craniad and obliquely ossified to the remainder of the stylohyal. This condition is obviously due to an

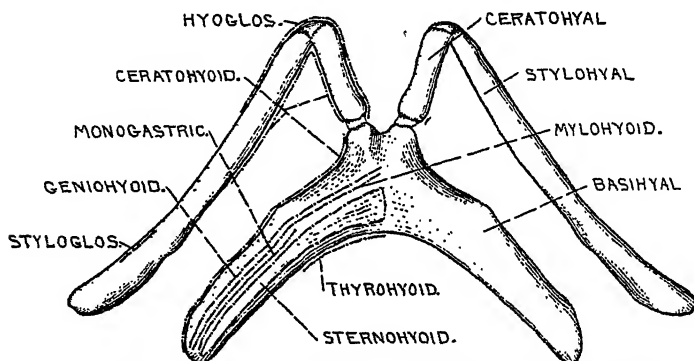


FIG. 4.—HYOID COMPLEX OF NEOMERIS, SHOWING POSITION OF MUSCLE ATTACHMENTS

irregularity in the position or relation of the centers of ossification concerned, and could hardly have been caused by any early fracture. The evidence, therefore, seems practically conclusive that what is here termed the stylohyal is a composite bone consisting of two components that originally represented a tympanohyal and a stylohyal. The ceratohyal as here designated, therefore, probably contains elements of both this bone and an epihyal. I believe that the latter is usually the one of this pair that first shows the effects of eliminating or reducing influences, but whether this is actually the case in the present instance can be determined only from embryological evidence.

#### VERTEBRAL COLUMN

In presenting vertebral measurements it must be borne in mind that the intervertebral cartilages, or at least many of them, have been eliminated during cleaning of the skeleton, and hence these measurements are an indeterminate degree smaller than would have been the case could they have been taken before preparation of the

skeletons. In addition, most of the epiphyses, both anterior and posterior, of numbers 239990 and 240003 have been separated in cleaning and the vertebral measurements of these specimens are consequently worthless for comparison.

*Body and appendageous measurements (in millimeters) of the skeleton*

Osteological detail	239990	240001	240002	240003	240862	49544
Length 7 cervical vertebrae----	46	33	46	47	30	53
Width of atlas-----	93	93	91	91	75	95
Width of 7th cervical vertebra--	59	57	58	70	( <sup>1</sup> )	69
Number of thoracic vertebrae--	12	12	12	12	12	13
Length of thoracic series-----	( <sup>1</sup> )	267	257	( <sup>1</sup> )	160	280
Narrowest thoracic vertebra-----	8th	8th	7th	8th	8th	6th
Narrowest thoracic vertebra-----	53	50	54	51	42	60
Height of 8th thoracic spine-----	15	13	12	13	( <sup>1</sup> )	21
Thoracic spines bifid-----	6-10	5-12	5-8	5-12	5-12	0
Number of lumbar vertebrae-----	13	12	13	13	13(?)	12
Length of lumbar vertebrae-----	( <sup>1</sup> )	335	298	( <sup>1</sup> )	182	289
Width of 4th lumbar-----	127	138	136	140	102	158
Number of caudal vertebrae-----	31	( <sup>1</sup> )	29	28+3	32	31
Length of caudal vertebrae-----	( <sup>1</sup> )	( <sup>1</sup> )	437	( <sup>1</sup> )	308	536
Last caudal bearing spine-----	16th	16th	16th	16th	16th	17th
First transverse caudal foramen--	7th	8th	8th	7th	7th	8th
Total number of vertebrae-----	63	( <sup>1</sup> )	61	63	64	63
Total vertebral length-----	( <sup>1</sup> )	( <sup>1</sup> )	1, 038	( <sup>1</sup> )	680	1, 158
Length of humerus-----	( <sup>1</sup> )	62	55	61	( <sup>1</sup> )	66
Length of radius-----	( <sup>1</sup> )	72	62	65	( <sup>1</sup> )	67
Per cent skull length to vertebral length-----	( <sup>1</sup> )	( <sup>1</sup> )	21	( <sup>1</sup> )	27	20
Per cent cervical vertebral length to vertebral length-----	( <sup>1</sup> )	( <sup>1</sup> )	4. 4	( <sup>1</sup> )	4. 4	4. 5
Per cent thoracic vertebral length to vertebral length-----	( <sup>1</sup> )	( <sup>1</sup> )	25	( <sup>1</sup> )	24	24
Per cent lumbar vertebral length to vertebral length-----	( <sup>1</sup> )	( <sup>1</sup> )	29	( <sup>1</sup> )	27	25
Per cent caudal vertebral length to vertebral length-----	( <sup>1</sup> )	( <sup>1</sup> )	42	( <sup>1</sup> )	45	46

<sup>1</sup> Detail imperfect.

*Cervical vertebrae.*—The first three cervical vertebrae of *Neomeris* are completely fused and the remaining four are free, though exceedingly thin. The measurement of length of the cervical vertebrae was taken from the inferior notch of the atlas to the posterior epiphysis of the seventh vertebra. It represents only about four and one-half per cent of the total vertebral length. The atlantic complex is exceedingly variable in a variety of ways. The transverse processes of the atlas and axis show great differences in development and conformation, but not much in total width. Another detail exhibiting much variation is the precise position of the dorsal lamina of the atlas with respect to the remainder of this complex, for in some specimens it is situated much more cranial, relatively, than in others. The inclination of the transverse processes of the seventh vertebra, as well as the greater total width at this point as compared



to that of the fourth, fifth, and sixth vertebrae, is also quite variable. This seventh vertebra has a costal facet for the capitular attachment of the first thoracic rib.

Allen writes (p. 250) that in all five of the specimens which he examined, as well as in Temminck's example, there was a pair of small accessory ribs in connection with the seventh cervical. In 240864 there was a pair of these cervical ribs attached by syndesmosis or shreds of fibrous tissue to the ventral aspect of the transverse processes of the seventh vertebra of this series. Careful search during dissection for cervical ribs in 240862 was without result. In the skeletons before me there are a number of bone fragments consisting of small pieces of broken ribs, chevron bones, and of processes of the vertebrae. Indistinguishable from these are doubtless some cervical ribs; but the only ones in which the latter may be identified as such with satisfactory certainty are as follows: No. 240001, one (19 mm.); 240002, two (19.2 and 18.5 mm.); and 49544, one (17 mm.).



FIG. 5.—CERVICAL VERTEBRAE OF NEOMERIS: A, DORSAL VIEW FACING CAUDAD; B, LATERAL VIEW OF RIGHT SIDE

*Thoracic vertebrae.*—The fact that five of the skeletons examined have but 12 thoracic vertebrae, which is a smaller number than heretofore recorded for this genus, is somewhat surprising. All of those considered by Allen had 13 save the one reported by Lydekker, which had 14. But one of the animals studied by me has 13 vertebrae in this series, while one (No. 240864, which was not cleaned) has 14. This series varies from 24 to 25 per cent of the total vertebral length.

The homology of certain of the vertebral processes of the Cetacea is a matter of some dispute, but the question certainly can not be settled until a thorough study of all known fossil as well as recent forms has been made. In those cetaceans in which the serial transition of the lateral vertebral processes is abrupt, as *Hyperoodon* and *Mesoplodon*, the question of homology is a different matter, which does not here concern us; but in *Neomeris*, which in this respect is comparable to the majority of whales, the conditions are tentatively believed to be as follows:

The centra of the first six thoracic vertebrae, as well as the seventh cervical, have facets for the capitular attachment of the first seven cervical ribs. There are no certain indications of parapophyses asso-

ciated with these facets, nor upon the centra of the vertebrae posterior to these. As with the remaining vertebrae of this series, the transverse process<sup>2</sup> of the first thoracic has a facet for the tubercular attachment of the first thoracic rib, but cranio-mediad thereto is a slight bony swelling. In each transverse process of the vertebrae, succeeding in caudal sequence, this swelling is larger, sharper, and farther removed from the tubercular facet. They also migrate gradually farther mediad and craniad until at about the ninth or tenth they have assumed the position of metapophyses, and in the posterior lumbar region, are situated dorsad of the neural canal. Those processes, on the other hand, upon which are located the tubercular facets, gradually migrate ventrad in the posterior thoracic region until by the time that the third lumbar is reached, the processes, which now lack the facets for articulation with the ribs, appear as arising from the centra. The transition is gradual and there seems to be no reason for considering them as other than diapophyses. In the anterior thoracic region, then, the transverse processes represent a fusion (or lack of separation) of met- and diapophyses, and these gradually separate to form distinct and widely separated processes. If there be parapophyseal elements present, these are not apparent.

It is denied, I believe, by many embryologists that there can be migration of any process from one center of ossification to another, but this hypothesis needs very convincing proof. In *Neomeris* the transition is gradual, there certainly appears to be such a migration, and therefore in some one vertebra this lateral process must spring from both of two centers of ossification, as illustrated by Flower (1876, p. 53). There are often shifts in the positions of muscles, and most processes are merely osteological indications of muscular stresses.

Craniad of the point at which the metapophyses become closely associated with the laminae of the adjoining vertebra there are fairly well developed postzygapophyses, but these disappear as processes farther caudad.

The vertebra of the thoracic series whose total width measures the least varies in position from the sixth to the eighth, and in breadth, from 42 to 60 mm. Craniad and caudad this measurement increases. The neural spines of this series, in any one individual, are all of approximately equal height, that of the eighth varying from 12 to 21 mm. (measured from the superior border of the neural canal) according to age, and possibly the sex of the individual. The spines of the anterior caudal vertebrae are directed straight dorsad, while both anterior and posterior to this region they are inclined some-

<sup>2</sup> The term transverse process is used herein merely in its physiographic sense to denote the most prominent lateral process of any vertebra.

what caudad. Due apparently to the incomplete fusion of the two halves of the vertebral arch as these develop from their respective centers of ossification, some of the thoracic spines (see table, p. 11) in all of the skeletons save 49544 are partially bifid.

*Lumbar vertebrae.*—The lumbar vertebrae are usually of such number as to compose with the thoracic series a complement of 25. Allen lists only two individuals with 25, one with 27, and the remainder with 26, while but one of my specimens is in the first-mentioned class. I imagine, however, that the vertebra which Allen considers to be the last lumbar I have placed in the caudal series. The length of the lumbar vertebrae varies from 25 to 29 per cent of the total vertebral length. The diapophyses of the first lumbar are abruptly of considerably greater length than those of the last thoracic. The third, fourth, or fifth of this series is the broadest (the fourth varies from 102 to 158 mm.), and thence caudad to the end of the tail there is a gradual decrease in the length of the diapophyses. The metaphyses are as described under the thoracic vertebrae, and there are no other processes except the neural spines. The more cranial of these are sometimes bifid, but not to the extent found in the thoracic series. In 239990 and 49544 the lumbar spines increase in height caudad, but in the others they are all approximately of the same size and but a trifle, if any, higher than in the thoracic region.

*Caudal vertebrae.*—There are 32 caudals in one, 31 in three, and 29 in one of the specimens before me. About a dozen of the terminal vertebrae are missing from the tail of 240001, and by comparison it is clear that there are three absent from that of 240003. Allen states that there are but 26 of this series in 49544, but he overlooked, or else did not have, four (placing the fifth with the lumbar series), and there are really 31, all unquestionably belonging to this one specimen, for its bones are darker and greasier than any of the others. The writer herein follows what seems to be the usual procedure in studies of cetacean osteology in considering that the first vertebra with facets for the attachment of a chevron constitutes the first of the caudal series. This, of course, is arbitrary, for there is no way of knowing where the cetacean tail actually starts, as in other mammals chevrons do not always begin at the same point in the series. Allen evidently considers that the first vertebra showing chevron facets is the last lumbar, although he does not actually say so. In the only three instances where this could be measured with accuracy the caudal series constitutes from 42 to 46 per cent of the vertebral length.

The more anterior of the caudal spines are the highest of the whole vertebral column, but thence caudad all processes decrease in size in caudal sequence until the terminal dozen are nothing more than bony

buttons. The last vertebra to have a minute neural canal is the sixteenth in two instances, seventeenth in another, and eighteenth in a fourth. The last vertebra to bear a spine is the sixteenth save in 49544, in which there may be said to be a small spine present on the seventeenth. The first vertebra to have a small foramen upon the dorso-lateral aspect of either side of the centrum is the seventh in four cases and the eighth in two. The more cranial of the chevron bones are large and well developed, but without my personally having cleaned the skeletons it is impossible to state their exact number with any confidence.

#### THORAX

*Ribs*.—As already stated, there are 12 pairs of thoracic ribs in five of the animals studied, 13 in one and 14 in another. The first seven have both capitular and tubercular attachment, the former being upon the centrum of the vertebra next cranial to the tubercular articulation. This is so in all cases save in one of Allen's specimens in which there were but six ribs in this class. The remaining ribs are attached only to the transverse processes or diapophyses. The first rib is much the stoutest and the others are inclined to become more slender in caudal sequence. The parts of the ribs usually designated as costal cartilages in most mammals are completely calcified. The first pair of these is especially robust and is attached to the sternum in peculiar fashion. In the only individual in which the majority of these sternal ribs are still connected with the sternum there are four pairs directly attached, and a fifth pair indirectly to the extreme caudal portion by cartilage. This seems also to be the case in two of the other specimens before me, while in the remaining three there are probably but three pairs with direct attachment and a fourth with a cartilagenous union; but the ribs are now disarticulated.

*Sternum*.—The sternal complex consists of a single bone, representing the fusion of an unknown number of component parts. It is shorter and more specialized than in the great majority of cetaceans and there is much variation in its shape, just as illustrated by Allen in the case of his specimens. The measurements of those before me, given in the same sequence as in Table 1, are 95 by 75 mm., 72 by 79, 99 by 82, 81 by 78, 65 by 56, and 89 by 83 mm. In each case the first figure given represents sagittal length, and the second, transverse breadth; so it is seen that the sternum may occasionally be broader than long. In two of the present specimens there are sternal fenestrations (caused by lack of ossification between centers) similar to those illustrated by Allen in his Plate 3. The latter also shows the manner of articulation of the first sternal rib, cranial with the cranial process and caudad with the lateral

process of the sternum, leaving a vacuity between. Most of the sterna are relatively flat, but that of 240002 is much curved in a sagittal direction, the convex aspect being directed ventrad.

The Cetacea have no clavicles.

#### ANTERIOR LIMB

The scapula is as shown in Figures 6 and 7, and described by Allen. There is very little variation in the scapula proper, but a great deal, constituting 100 per cent, in the width of the acromial process. The coracoid process is fairly uniform save in 240002, in which there is a well-marked accessory process extending ventrad. This suggests some sort of muscle attachment, but in the two specimens dissected there was no muscle connected with either of these processes, and in comparison with most cetaceans their development is very weak.

From the prepared specimens it is impossible to secure the length of the fore limb for the reason that some of the more distal elements, including the cartilage, are missing. In the material available the humerus may be practically as long as the radius but it is usually somewhat less (from 86 to 99 per cent). Details of especial interest are the large medial tuberosity, to which are attached the subscapularis and mastohumeralis, showing considerable variation in its precise configuration; and the infraspinous fossa, located toward the cranial border of the lateral aspect. It should also be noted that the distal extremity of the humerus is much flattened in a latero-medial direction, and that the articulation at this point is immovable.

As illustrated, the central portion of the radius is almost twice as broad as of the ulna. The former bone has no prominent features, and the latter, little of interest save the olecranol process, upon which is inserted the very decadent triceps. It is very slightly developed in comparison to that of most whales.

The carpal elements are as figured by Allen (p. 253). There is very little variation save in the degree of ossification, and hence separation, of the different bones, this depending upon age.

The second digit is evidently the longest, and in the only specimen in which the distal end is not missing, it has eight bones, including the metacarpal. It seems that the second phalanx of the pollex is the one last to form, and hence, is entirely absent in the younger individuals.

#### PELVIC BONES

In 240862 the pelvic bones measure 36 mm. in length and were located barely caudad of vertical to the vulva, being 40 mm. from the midventral line, to which they are approximately parallel, and there-

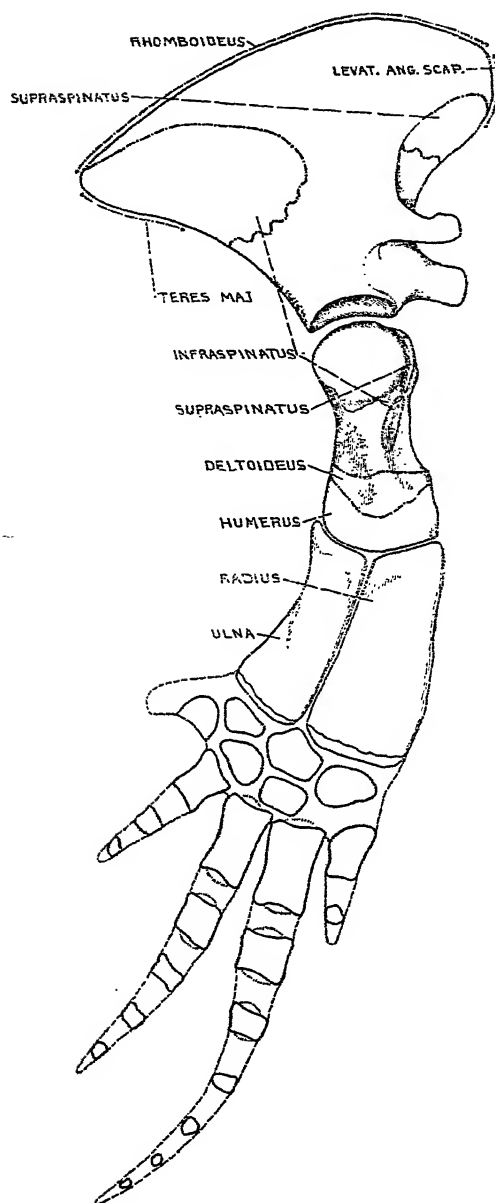


FIG. 6.—LATERAL VIEW OF FORE LIMB OF NEOMERIS,  
SHOWING MUSCLE ATTACHMENTS

fore not quite parallel to the body axis. In height they measure 4.5 mm. and 2.5 mm. in thickness. Only in two other specimens could bones be selected from an assortment of broken ribs which with entire certainty could be pronounced as pelvic bones. In 240002 they measure 39.5, and in 239990, 63 mm. in length. In the largest specimen

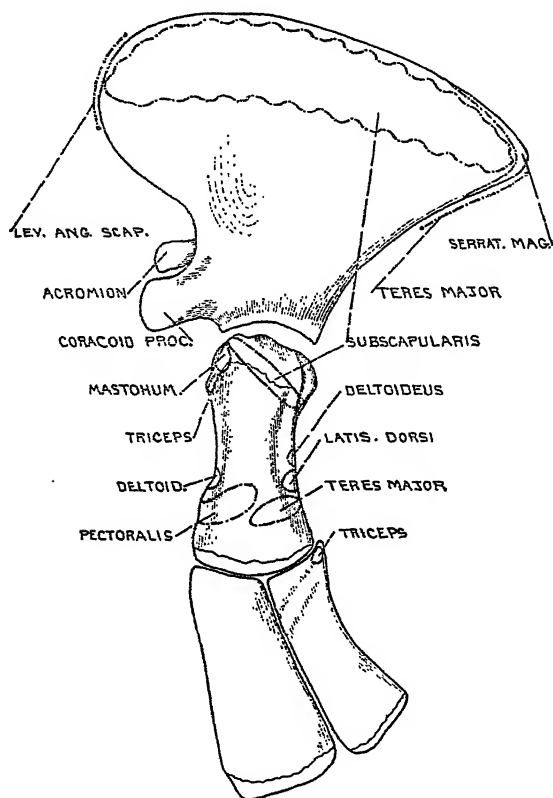


FIG. 7.—MEDIAL ASPECT OF THE THREE PROXIMAL SEGMENTS OF THE FORE LIMB OF NEOMERIS, SHOWING MUSCLE ATTACHMENTS

at Allen's disposal this figure was 65; so it is seen that they vary much in length.

#### MYOLOGY

Some of the older works on the anatomy of the Cetacea are anything but satisfactory. For this reason but three papers on the musculature of the order have been used for the comparison of all details of the musculature of *Neomeris*. These, given in the order of their value in the present connection, are Schulte's and Smith's work on the muscles of *Kogia* (1918), Schulte's report on *Balaenoptera borealis* (1916), and Murie's work on *Globiocephala* (1873). There

are features of the latter that are somewhat difficult to reconcile with the anatomy of the Cetacea as reported by others, and the descriptions are far from complete, while the anatomy of *Balaenoptera*, this being a whalebone whale, is very different in many respects from *Neomeris*. In addition, certain muscles of *Phocaena* (Stannius, 1849) are compared, while the work on *Balaenoptera* by Carte and McAlister (1869) is mentioned occasionally. In the following pages these papers are usually referred to by the names of the genera concerned—seldom by the authors.

It should be mentioned that there is probably considerable individual variation of certain myological features. Thus, direct comparison showed much difference in size of the superficial masseter in the two specimens dissected, while the mastohumeralis was small in the second, but was recollected as being considerably larger in the first individual examined.

After removing the integument it is found that the blubber may be as much as 25 mm., but for the most part is usually 15 or even 10 mm., in thickness. It is practically absent from the lateral peduncle, the flippers, and the sides of the head. Beneath the frontal prominence is a deposit of soft, spongy fat from which the oil runs when this region is pressed with a finger. This is about 50 mm. in thickness and is roughly cylindrical, with bounds ill defined. Above the rostrum, too, there is much fatty tissue, but of tough, spongy consistency. Conspicuous throughout the blubber, especially of the sides, are many large lymph vessels.

A noteworthy characteristic of the musculature of this, and very likely all cetaceans, is the fact that in many areas the muscles are not attached directly to the bones, but rather to a tough membrane which invests the bone more or less loosely. Such a membrane covers most of the occipital region of the skull, especially about the exoccipitals, the entire scapula, the ribs, and portions of the vertebrae are so sheathed. In modified form it occurs upon the hyoid, but not the humerus.

The *panniculus carnosus* is complicated. As in most if not all cetaceans, there is a tendinous raphe (although it seems sometimes to have been overlooked) extending caudo-dorsad from the caudal border of the flipper, it being clearly distinguishable as such for at least 200 mm. Into this raphe are inserted muscle fibers with a slight cranial inclination running both from the dorsal and the ventral regions. Upon the anterior and central thorax the fibers are not distinguishable until quite well ventrad toward the flipper, but slightly farther caudad they extend from the middorsal line. Here, however, there is interruption of the continuity of the fibers



between the dorsum and the lateral sheet (fig. 8). In the anterior lumbar region there is no such hiatus, and for a short distance the fibers run from the middorsal line well down over the flank. Ventrad of the axilla the fibers of this muscle extend quite to the mid-ventral line, but farther caudad they do not run so far ventrad. Discernible fibers of the main sheet of the panniculus cease dorsad of the anus; but there are superficial fibers converging to the anus and vulva. These seem to constitute a specialized portion of the panniculus, now segregated from the main sheet and undoubtedly having the function of a *compressor mammae*. About the mammary orifice there are vestiges of fibers so placed as to constitute a modified sphincter.

Most investigators of the Cetacea have not differentiated a platysma from the panniculus, and the condition of the specimens at hand precluded an attempt at such a division. The suprabrachial portion

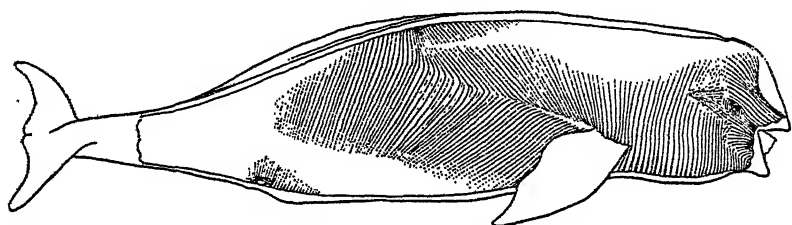


FIG. 8.—PANNICULUS CARNOSUS AND OTHER SUPERFICIAL, SKIN MUSCULATURE OF NEOMERIS

of this superficial sheet has origin from the midventral line. The more ventral portion of the muscle is extremely heavy, the fibers being very coarse and loosely joined, with many small cavities of varying size, as large as a couple of millimeters in breadth, throughout the mass. In life these cavities may be filled with soft fat or oil. The consistency of this portion of the muscle is such as to suggest that there may possibly be some glandular action—perhaps certain elements of a specialized submaxillary gland. No parotid gland was encountered. This part of the muscle, then, extends craniad almost to the chin, and the fibers run dorsad to the midlateral region but cease before the eye or ear are reached. Insertion of the panniculus fibers onto the tough, superficial tissue of the brachium is continuous around the entire humerus.

*Kogia* is figured as having a wider, more extensive raphe running more caudo-ventrad than caudo-dorsad. The panniculus sheet is evidently more extensive, meeting the middorsal and midventral lines for a considerable distance and stretching to the peduncle. Except for the absence of the lateral raphe in Murie's figure the panniculus of *Globiocephala* seems to be very similar to, although somewhat less

complicated than, that of *Neomeris*. *Balaenoptera* has the raphe prolonged practically to the peduncle, and its panniculus as a whole is simple and much more extensive.

#### FACIAL MUSCULATURE

As the innervation of the muscles of *Neomeris* was not attempted, due to the condition of the specimens, the homology of the facial muscles is in doubt, and the names applied to them are either functional or topographical.

For a distance of 25 mm. from the lower lip, upon the entire side of the rostrum, about the eye and in front of the ear, there is situated beneath the skin tough, fibrous tissue so gristly that it could only be whittled away with a very sharp butcher knife, as it was impossible to apply sufficient manual force to an ordinary scalpel for dissection of this tissue. Throughout there extend coarse, specialized muscle fibers, but the whole is too nearly immobile for these to have much if any muscular function. For the reasons stated, no very painstaking dissection of these areas was made. The directions of the fibers were, of course, carefully noted; but the interrelationship of these was very complex.

There is a fairly well defined *orbicularis oculi*, but the area about the eye is so fibrous that the degree to which this muscle can function is a question. There is also a tough layer extending from the region of the auditory tube with fibers diverging about the eye, and this would probably prove to consist of several muscles. The horny tissue surrounding the lips and extending caudad below the eye evidently represents an *orbicularis oris*, but this is so hard that it is difficult to understand how the animal opens and closes the mouth with the facility that must be necessary. A few fibers which may possibly constitute a remnant of a *depressor auriculæ* were present, but the homology of these fibers is extremely uncertain.

There is a *nasorostralis superficialis* originating from the vicinity of the medial portion of the anterior rostrum and running up over the whole face. The toughness of the region, however, causes the primary use of this tissue to be as a shock absorber, with the drawing forward of the anterior lip of the blowhole as a secondary function. The *nasorostralis profundus* is very similar to the more superficial division, but is less robust, with origin that extends farther along the lateral rostrum. It is less fibrous than the superficial part, but like it the fibers have fascial insertion craniad and laterad of the blowhole.

The original portion of the *dilator naris* is apparently indivisible. The origin is from in front of the vertex around the margin of the maxilla, from over the supraorbital prominence, and robustly from the cartilagenous tissue ventrad of the lachrymal.

The insertional portion is, however, divisible into two parts. The *pars posticus* consists of those fibers originating caudad to an imaginary transverse line passing through the blowhole. Insertion is upon the caudal margin of the latter and for some distance deep to the orifice. The *pars anticus* arises rostrad of the imaginary line mentioned above and is inserted not upon the dorsal membrane covering the superficial respiratory sac (see p. 39) but upon the lateral and ventral portion of this sac, and upon the dorsal membrane of the deeper sac.

Deep to the anterior part of the dilator is a small layer of fibers, which may or may not constitute an entirely separate muscle. It arises along the ridge situated just laterad of the most anterior of the maxillary foramina, and is inserted lightly upon the ventral membrane of the deeper respiratory sac and into the cartilagenous tissue cranio-ventrad to it. Surrounding the deeper portion of the blowhole, especially rostrad, is fibro-muscular tissue of very fine texture. Because of its situation this must have some mobile function, which one might be inclined to doubt merely from an examination of the tissue.

The facial musculature of *Kogia* and *Balaenoptera* seems to be so radically different from that of *Neomeris* that without knowing the innervation of all or making direct comparisons, an attempt to homologize the muscles would be useless. Murie's figures, but not his text, for *Globiocephala* show an occipito-frontalis and levator labii superior alaeque naris, which evidently correspond with what are herein termed the two divisions of the dilator naris; and Murie's nasolabialis corresponds in situation to the muscle of *Neomeris* to which the same term is given; but for *Globiocephala* the insertion is stated as deep, while in *Neomeris* it is superficial.

The *buccinatorius* is quite thin and weak. It originates from between fibers of the nasorostralis and is inserted upon the membrane of the mandible.

*Neomeris* has a small muscle tentatively termed, because of its position, the *tympano-zygomatikus*, which stretches from the more ventral portion of the zygomatic process of the squamosal to the tissue investing the ear bone, with fibers running cranio-dorsad. Whatever may be its chief function, it adds strength to the weak articulation of the mandible with the skull. This may possibly be homologous with the depressor mandibulae as described for *Kogia* and *Balaenoptera*, but this is considered to be extremely doubtful, as the fibers are directed differently and the function can not be the same.

#### MUSCLES OF MASTICATION

The masticatory musculature of this animal is very poorly developed and is clearly degenerate.

The *masseter* occurs in two divisions. The *pars superficialis* has origin from the tissue about the termination of the zygomatic process of the squamosal and the postorbital process of the frontal, and is inserted upon the membranous covering of the ventro-lateral border of the mandible. In the first specimen dissected this division was relatively robust, but in the second its development was extremely slight. Due to the weak origin of this part it can have but slight functional importance. The *pars profundus* is also small and has origin, not from any bone but from the tough tissue within the orbit and beneath the styliform process. Insertion is upon the dorsal margin of the mandible adjoining. This division is stronger than the superficial, but yet one is forced to the conclusion that neither plays an important part in the economy of the animal.

The masseter of *Neomeris* is much smaller than in *Kogia* and is not involved with the tough, fibrous, superficial musculature of the cheek. The origin is farther caudad than in the latter genus, which changes the inclination of the fibers. That of *Balaenoptera* seems also to be comparatively somewhat larger, while it is difficult to judge of the development in the figure of *Globiocephala*.

The *temporalis* is small and evidently indivisible. It arises from the temporal fossa and passes beneath the postorbital process of the frontal. Insertion is upon the border and adjoining lateral face of the coronoid process of the mandible.

Comparison of the skull of *Neomeris* with those of *Kogia*, *Globiocephala*, and *Tursiops* indicates that although the temporal is relatively no broader in the three last-mentioned genera, it is much deeper and more robust. Comparison of the skull of *Neomeris* with that of *Balaenoptera* is hardly practicable, due to the difference in size; but Schulte's figure indicates that the temporal is broader in the last-mentioned genus. The temporal of *Neomeris*, in fact, must be regarded as slightly developed and correspondingly weak.

No separation of the *pterygoideus* was possible in the present animal. Origin is from the membrane investing the falcate process and the portion of the border of the pterygoid bone adjoining, as far rostrad as the notch for the passage of the internal auditory tube. Insertion is not upon the mandible, but upon the tough tissue near the ear bone. Hence, this muscle is nonfunctional as far as its usual duties are concerned, but it may have some use in connection with the neighboring trabeculated air sinus.

In *Kogia* the pterygoid is not only described as double, but the internal division is again separable. Insertions of all are upon the mandible, and they seem to be well developed. Schulte found the muscle to be double in *Balaenoptera* also, but Carte and McAlister reported it as single in the same genus. The former authority

stated that only the internal division reaches the mandible, the external portion having insertion upon the cartilage adjoining. This muscle is neither figured nor mentioned for *Globiocephala*.

#### INTERRAMAL MUSCULATURE

The powerful *monogastricus*, or rostral belly of the more usual digastricus, has origin from the lateral 30 mm. of the basihyal, and insertion along practically the entire medial margin of the mandible. Its original end is especially heavy.

Schulte terms this muscle the hyomandibularis. In *Kogia* the origin was just twice as long, relatively speaking, for it was from the entire basihyal instead of the terminal half. And in this genus the insertion is much more restricted than in *Neomeris*. *Balaenoptera* has a very large muscle associated with the cavum vertrale, which Schulte terms the sternomandibularis. His description of this is so complicated that to a reader it is somewhat ambiguous. He finds that it is imperfectly divisible, and one of the slips he considers to be homologous with the anterior belly of the digastric. An opinion of value certainly can not be offered without examination of a specimen, and no further discussion is here attempted. The anterior belly of the digastric of *Globiocephala* is figured as being large, but evidently with a more restricted insertion than that of *Neomeris*.

With strong origin from the entire border of the basihyal and from the usual medial raphe, the fibers of the *mylohyoideus* extend cranio-laterad to an insertion along the medial margin of the mandible. This type of mylohyoid seems to be rather uniform in the Cetacea.

#### MUSCLES OF THE TONGUE

The slender and rather weak *styloglossus* has origin from the cranial border of the stylohyal some 20 mm. from its termination. It runs practically parallel with the neighboring portion of the mandible and is inserted into the lateral border of the tongue. This muscle seems to be very similar in *Kogia*, *Globiocephala*, and *Phocaena*, but Schulte failed to find it in *Balaenoptera*.

The *hyoglossus* has origin from the more cranial portion of the stylohyal and the ceratohyal, with a few fibers from the basihyal. The fibers then converge and extend into the medial part of the tongue.

In *Kogia* and *Phocaena* this muscle is very similar to that of *Neomeris*. In the other two genera considered it seems to be inseparable from the *genioglossus*. As in *Kogia* and *Phocaena*, this muscle has no attachment to the hyoid. Origin is from the tissue of the ventral surface of the pharynx cranial of the hyoid system, and insertion is into the tongue. In *Balaenoptera* and *Globiocephala*

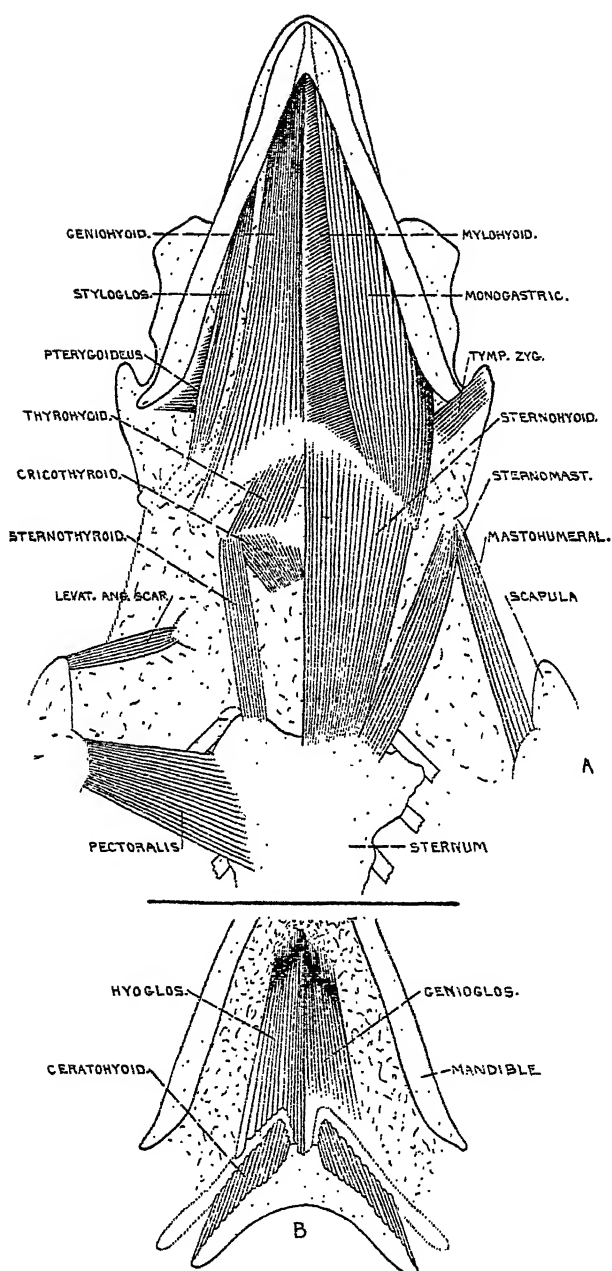


FIG. 9.—MUSCLES OF THE VENTRAL ASPECT OF THE THROAT OF NEOMERIS: A, MOST SUPERFICIAL MUSCLES (EXCEPT PECTORAL) TO RIGHT OF CENTER; NEXT LAYER TO LEFT; B, DEEPEST MUSCLES OF TONGUE

the hyoglossus and genioglossus are figured as being inseparable, but in the text concerning the former the two muscles are described separately. At any rate, in these two genera the attachment is to the mandible, the raphe, and the hyoid.

There is a *palatoglossus*, with origin from the bony palate and insertion into the base of the tongue, as described for *Balaenoptera* but not for *Kogia*, and this muscle is not figured for *Globiocephala*. There are also transverse fibers of a *lingualis*, such as described for *Balaenoptera*.

#### MUSCLES OF THE NECK

*Superficial and hyoideal groups.*—The *sternomastoideus* is powerful, with origin from the cranio-lateral angle of the sternum and insertion upon the membrane over the lateral border of the exoccipital. This muscle is much more robust than in *Kogia* or *Balaenoptera*, but the sternomastoid of *Globiocephala* evidently approaches it in size.

The *mastohumeralis* is a thin muscle arising from the membrane over the border of the exoccipital, caudo-dorsad of the attachment of the sternomastoid. Insertion is upon the cranial portion of the medial tuberosity of the humerus. This muscle is evidently homologous with the usual mammalian cleidomastoid. Schulte thinks that in *Balaenoptera* it contains elements of both the cleidomastoid and the trapezius. In the latter genus Carte and McAllister found that origin was also from the transverse processes of some of the cervical vertebrae, but Schulte did not. The muscle is evidently present in *Glodiocephala*, Murie referring to it as the cephalohumeral.

No omohyoid was observed in the present animal, and there is none in *Kogia*, *Phocaena*, nor apparently in *Globiocephala*, but Schulte found it present in *Balaenoptera*.

The immense *sternothyroideus* has origin from the sternum, extending from the cranial notch to the cranio-lateral angle, and it is inserted along practically the entire length of the basihyal. It is thus an exceedingly powerful muscle, especially craniad. Its large size is evidently characteristic of whales, for it is essentially similar in all cetaceans so far investigated.

The *sternothyroideus* is very slender and weak. It does not approach the medial line but has origin from the latero-cranial process of the sternum, and is inserted upon the lateral portion of the thyroid cartilage. This muscle is apparently similar in *Kogia*, *Balaenoptera*, and *Phocaena*, although in the first mentioned genus Schulte states that origin is also from the cartilage of the first rib. The illustration for *Globiocephala* shows this muscle as enormous, to such an extent that I suspect there may have been an error made

in the lettering and what is marked as this muscle is really the sternohyoid.

The *thyrohyoideus* extends medio-cranial from the lateral portion of the thyroid cartilage to an insertion upon the caudal border of the hyoid. In the other genera considered it apparently exhibits no peculiarities.

The *geniohyoideus*, which lies deep to the mylohyoid, has origin along the entire cranial border of the basihyal, with apparently no direct connection of the fibers with the mandible, but rather into the cranio-ventral portion of the tongue. This fact was not determined with certainty as this could not be done without damage to the mandible, which it was desired to avoid.

In *Kogia*, *Phocaena*, and apparently *Globiocephala*, connection is with the mandible, while in *Balaenoptera* this muscle was not found at all.

The *ceratohyoides* takes origin from practically the entire cranio-dorsal border of the basihyal and is inserted upon the caudo-dorsal border of the medial half of the stylohyal and the adjoining border of the ceratohyal. This muscle seems to be very similar in *Kogia* but is not mentioned for *Balaenoptera*. Murie figures it for *Globiocephala* and terms it the interhyoideus.

The *hyoepiglotticus* is a small, short muscle extending from the cranio-dorsal part of the hyoid to the epiglottic cartilage.

*Deep lateral and subvertebral group.*—There seem to be but two *scalenus* muscles, both powerful, in the present animal. The *scalenus dorsalis* arises chiefly from the first rib, but more dorsad there is also a slip from the second rib. Cranial it becomes very thick and is inserted not by separate slips but continuously upon the membrane investing the transverse process of the fused axis, the caudal ridge and extremity of the transverse process of the atlas, and the border of the exoccipital. The *scalenus ventralis* arises from the costal cartilages of the first five (approximately) ribs, and converging strongly, insertion is upon the lateral border of the exoccipital and the adjoining medial border of the falcate process.

All whales seem to have but two divisions of the *scalenus*, the *anticus* being the missing part. In *Kogia* the *dorsalis* (*medialis*) arises from the first rib only, and is much larger than the *ventralis* (*posticus*), which also arises from the first rib and is inserted upon the transverse processes of all the cervical vertebrae. In *Balaenoptera* the muscle complex of which the *scalenus* is a part is very much involved, and Schulte's description of the conditions encountered is not particularly illuminating. There are two divisions of the *scalenus* in this genus also, however. Both seem to arise from the first three ribs, with fibers from additional ribs. For *Globiocephala*



Murie shows but a single muscle, although another may be present.

There is a powerful muscle, the deepest of the infravertebral muscles of the cervical region, which is probably homologous with the

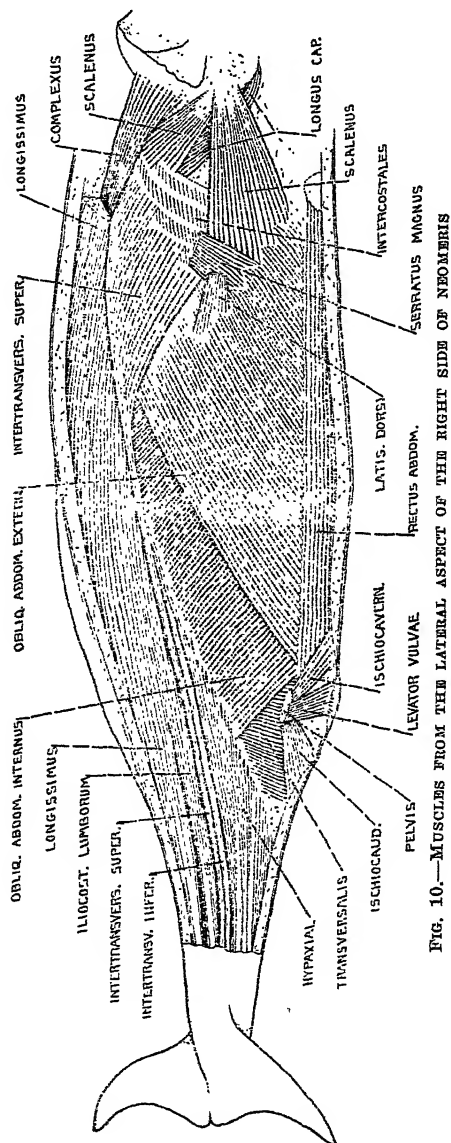


FIG. 10.—MUSCLES FROM THE LATERAL ASPECT OF THE RIGHT SIDE OF NEOMERIS

*longus capitis* (rectus capitis anterior major). In the present specimen this could not be divided, but whether or not this be actually the case, it undoubtedly contains elements of the longus colli, and possibly of the rectus capitis anterior minor as well. It arises from the

cranio-ventral margins of the transverse processes and bodies of several of the more cranial thoracic vertebrae, and is inserted first upon the expanded ventral portion of the atlas and upon the basioccipital much after the fashion illustrated by Schulte for *Balaenoptera*. In fact, this muscle mass as a whole appears to be very similar to that of the latter genus: but *Kogia* has no longus capitis—only a rectus capitis anterior minor and longus colli. *Phocaena* has all three, as has *Globiocephala*.

#### MUSCLES OF THE THORAX

As the sternum of *Neomeris* is so greatly reduced, the *pectoralis* is small, and although it may well be divisible, this could not be demonstrated because of the condition of the specimens. There is no scapular attachment. Origin is less than 50 mm. broad, from the lateral fossa of the cranial half of the sternum, with insertion upon the disto-caudal portion of the medial aspect of the humerus.

In *Kogia* the pectoral is double, with a third slip corresponding to the abdominal pectoral. In this genus the deeper pectoral inserts upon the coracoid, and this is the case in *Phocaena* as well. In *Balaenoptera* the muscle is single, as is apparently also the case in *Phocaena*. In *Globiocephala* there are two divisions, but the ectal one is shown as many times the size of the ental. In all of these the pectoral mass is very much more extensive than in *Neomeris*, which is correlated in large part with the fact that the sternum is much the most restricted in the latter.

The *serratus magnus* or anticus arises by muscle bundles from about the third to the sixth or seventh ribs; but the muscles of this region were in bad condition and the extent of the attachments could be distinguished only approximately. The muscle passes over the more caudal portion of the medial face of the scapula and is inserted upon the scapular membrane for a short distance in either direction from the Glenovertbral angle. It is weak in its development.

As might be expected, origin of this muscle is variable among the Cetacea. In *Balaenoptera* Schulte states that origin is from the fourth, fifth, and sixth ribs, while for the same genus Carte and McAlister found it coming from the eight most caudal ribs, with a slip from the second. In *Kogia*, however, origin is from the first three ribs, while in *Phocaena* it extends to the fifth. Murie states that in *Globiocephala* this muscle extends from the transverse process of the atlas to well toward the caudal part of the thorax, but this seems questionable. Insertion is very similar in all.

No attempt was made to investigate the intercostal or sternocostal muscles.

## MUSCLES OF THE ABDOMEN

The *rectus abdominis* is a heavy muscle, but the origin is very weak for its size, and is neither from the pelvic bone nor from a definite aponeurosis descending cranio-ventrad, as is the case in *Kogia*, and apparently *Balaenoptera* as well. Rather do the fibers arise just craniad of the vulva from between the fasciculi of the lateral abdominal muscles. Insertion is upon the caudal portion of the sternum, and very likely from the costal cartilages adjoining. The details of the origin of this muscle in *Globiocephala* can not be seen in the illustrations of this animal.

The *obliquus abdominis externus*, with fibers running caudo-ventrad, has origin by bundles from a number of the more cranial ribs about at the junction of the latter with their costal cartilages. The caudal border of the muscle is on a line running from about the twelfth thoracic vertebra to a point just craniad of the vulva, and insertion is upon the sheath of the rectus abdominis.

The *obliquus abdominis internus*, with fibers running cranio-ventrad, arises from the deep dorsal fascia and several of the more caudal ribs, including the sternal portions. Insertion is upon the aponeurosis continuous with the rectus sheath. At its ventral termination it does not extend posterior to the vulva, and hence at this point it is not located caudad of the external oblique. Its origin, however, terminates about on a line dorsad to the anus.

Both oblique muscles are apparently substantially similar in the other cetaceans considered.

The *transversus abdominis* or transversalis, with fibers extending caudo-ventrad, arises from the deep dorsal fascia investing the long system of the back, and from the caudal border of the thorax along the costal terminations. Insertion is upon the deep portion of the rectus sheath and the tissue about the urino-genital orifices. This muscle extends for some distance caudad of the abdominal obliques, and to this extent differs from *Kogia*.

Judging from the published descriptions it seems that the muscular layers composing the abdominal walls of the Cetacea are somewhat heavier than usual.

## VERTEBRAL MUSCULATURE

*Secondary back muscles*.—The trapezius group is lacking. The *latissimus dorsi* is small and weak. Because of the condition of the specimens the fibers of the original portion could not be followed with satisfactory detail. It springs, however, by bundles from several of the costae, and insertion is onto the medio-caudal part of the humerus distad to its middle. This is essentially similar to the condition in the other Cetacea discussed.

An attempt to divide the *rhomboideus* was unsuccessful, possibly because of the condition of the specimens. This is a large muscle, with origin from the middorsal line as usual and insertion onto the investing membrane of the scapula along the entire vertebral border. The muscle is single in *Balaenoptera* and apparently in *Globiocephala* also, but divisible into a superficial and a deep layer in *Kogia*. In all three the attachments and extent are substantially the same. There is no occipitoscapularis in *Neomeris*, this genus thus apparently agreeing with *Balaenoptera* and *Globiocephala*, but not with *Kogia*, in which it is present.

There is a very weak *levator anguli scapulae* or atlantoscapularis. Origin is from the transverse process of the atlas, and insertion upon

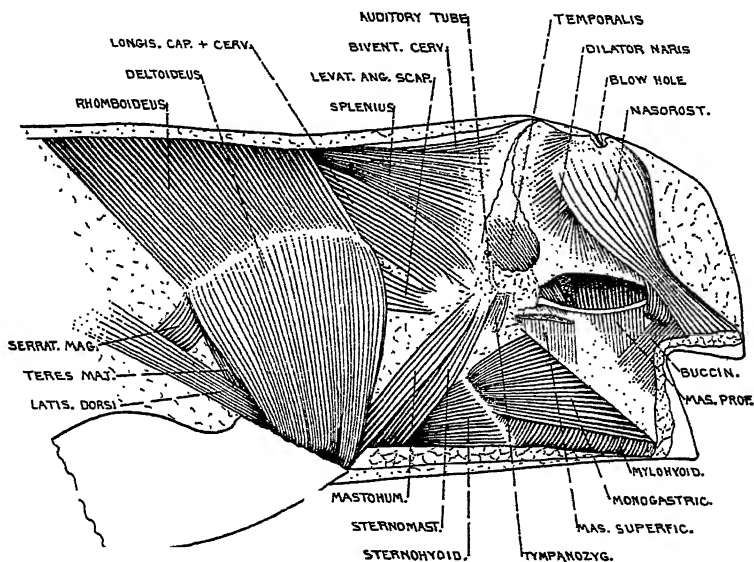


FIG. 11.—BODY AND DEEP NECK MUSCULATURE OF RIGHT SIDE OF NEOMERIS

the scapular membrane over the coracovertebral angle and along the border for a short distance ventrad. In the other genera mentioned this muscle is very similar, but there seem to be slight differences in the precise disposition of the insertion.

*Intrinsic back musculature.*—The *splenius* is very thin, with origin from some 100 mm. of the middorsal line. The fibers, running cranio-laterad as usual, are inserted upon the occipital in a line extending from 25 mm. laterad of the vertex almost to the squamosal. In *Balaenoptera* this muscle seems to be thicker but narrower; in *Kogia* it is both narrow and thin, inserting merely onto the exoccipital; while in the illustrations of *Globiocephala* it is shown as an immense mass of muscle.

Definition of the superficial divisions and of the cervical portion of the long system of the back musculature was entirely satisfactory, but preservation was so poor that any disturbance of the deeper portion resulted in the fibers falling apart in inextricable confusion, so that the deeper fibers were not investigated. Equally unfortunate is the fact that the peduncle was somewhat hardened and suffered further desiccation during dissection, so that the tendons in this region could not be precisely followed.

From the ectal aspect the central dorsal region of the longissimus mass of the long system is indivisible save for a thin medial sheet (fig. 11) which may be separated from the underlying fibers from about the sixth thoracic to the third or fourth lumbar vertebra. The homology of this sheet is not certain, although its relationship probably lies with the *spinalis dorsi*, occurring as a distinct muscle in most mammals. The muscle mass underlying this could not be separated and the fibers originate apparently from both the spinous and most of the transverse processes of the vertebrae concerned.

Progressing caudad, there is gradual separation of this single longissimus belly into a dorso-medial *longissimus dorsi*, arising from the spinous processes, and an *iliocostalis lumborum*, with origin from the medial three quarters of the transverse processes. Toward the peduncle these two divisions constitute very distinct muscles, each invested by a tough, glistening aponeurosis. They both develop strong tendon bundles in this region, which increase in strength and size caudad until the muscle fibers cease entirely.

Laterad of the splenius is a heavy muscle continuous with the long system and undoubtedly constituting what in this case may be termed a *longissimus capitis et cervicis*. The more ventral fibers originate from the vicinity of the tubercula of the first four (?) ribs. Passing latero-cranial, insertion is upon the membrane over the border of the exoccipital and upon the transverse process of the atlas as well. An effort was made to separate this mass into two distinct muscles on a line between the cervicis and capitis portions, but without success.

Largely deep to the splenius there is a broad muscle continuous cranial with the long system which apparently constitutes a semi-*spinalis capitis*. It is separable with ease, and the more superficial division must therefore be termed the *biventer cervicis*, and the deeper, *complexus*. The fibers of the biventer which do not continue directly from the indivisible longissimus have origin from the lateral portion of the transverse processes of several of the thoracic vertebrae and the tubercula of their ribs. Insertion is along the entire supraoccipital from practically the middorsal line to a point on the exoccipital caudad of the zygomatic process of the squamosal.

The complexus is smaller and lies directly deep to the biventer cervicis. Origin is from the cranial border of the transverse processes of several of the more cranial of the thoracic vertebrae. There is also slight attachment by fasciculi to the transverse process of the atlas. At the insertional end the muscle is very thin but the area of attachment is broad and fascial upon the wide area of the supra- and exoccipitals beneath the biventer.

A muscle which seems to correspond with the *semispinalis cervicis* has origin apparently from the bases of the spines of the first two thoracic and the seventh cervical vertebrae, with insertion upon the caudo-dorsal process of the atlas.

From the last-mentioned situation, with fibers interdigitating to some extent with those of the *semispinalis cervicis*, there originates a *rectus capitis*, which was indivisible in the present specimens. It is the deepest muscle inserting upon the supraoccipital.

The description of the long dorsal system of *Kogia* is extremely intricate and involved, indicating dissection of a high degree of excellence, but not easy to follow without repeating the work. Substantially, the thoracic and lumbo-dorsal portions seem to be very similar to *Neomeris* save that there is an iliocostalis thoracis distinguishable as a separate division, and Schulte does not mention any partially divisible, thin, medial sheet upon the dorsum such as occurs in *Neomeris*. The cervical muscles of *Kogia* are somewhat differently arranged than those of *Neomeris*. The former seem, on the whole, to be more complicated and specialized, as well as stronger, but this may be due to the condition of the porpoise specimens. For the same reason it is unwise to attempt too precise a homologization of the cervical muscles of these two, because of inability to investigate origins of the muscles in greater detail.

The description of this complex in *Balaenoptera* is much easier to follow. On the whole, it is not dissimilar to *Neomeris*. The longissimus, including the capitis portion which Schulte here terms trachelomastoid, is essentially the same. He found the *semispinalis capitis* to be very much larger, but did not mention its divisibility, save for the deep connection of fasciculi with the underlying muscles. He did, however, find that there was a greater number of deeper cervical muscles than are possessed by *Neomeris*.

Murie shows a distinct iliocostalis lumborum in *Globiocephala*, but not a more cranial iliocostal, while both his figures and meager descriptions of the cervical muscles are rather ambiguous. The same applies to Stannius's description of *Phocaena*.

There has been lengthy discussion of the long, dorsal musculature of the Cetacea by almost everyone who has mentioned the subject, many attempting to subdivide and homologize the muscular details

to an unwise extent. Sufficient is not yet known regarding the anatomy of divers forms of cetaceans for the presentation of a convincing discussion of this sort, and the present writer shall certainly not attempt to add to the confusion of the subject.

*Lateral back musculature.*—The term transversarii for the two lateral back muscles is open to the objection that it too closely resembles the transversalis of the abdominal region. Murie's designation of supra and infracaudalis can not be criticized on the same grounds, but the names are somewhat ambiguous. Although now apparently distinct from the intertransversarii as we usually know them, the two lateral back muscles evidently constitute a specialization of a part of these, and hence will be termed the superior and inferior intertransversarii.

The *intertransversarius superior* is in cross section wedge shaped, and the fibers are not arranged in herring-bone pattern as was the case in *Kogia*. They originate from the terminations and for a short distance upon the dorsal surface of the transverse processes of the lumbo-caudal vertebrae, the muscle being strongly tendinous only toward the peduncle. At the last rib, progressing craniad, a thin sheet of muscle seems to diverge over the more dorsal part of the thorax, terminating at the fifth, fourth, and third ribs, as shown in Figure 11. This is included as a part of the intertransversarius only because it apparently agrees so well with Schulte's figure and description of *Kogia*. Due to the condition of the specimens, this could not be dissected to my satisfaction. I am neither convinced that it is really a part of this muscle, although the two seem to be continuous, or that it is not homologous with a serratus posterior; but the question must be left unsettled for the present.

*Kogia* and *Phocaena* are apparently the only cetaceans heretofore dissected which have this expanded thoracic sheet. Schulte also found a slip of the same muscle extending craniad from the first rib to the occiput dorsad of the scalenus dorsalis. That such a slip may have been present in *Neomeris* as well, but remained undetected because of the partial decomposition of the specimens, can not be denied. The postcostal portion of this muscle seems to be rather uniform in all the genera discussed, save that in *Kogia* the fibers are arranged in herring-bone pattern.

The *intertransversarius inferior* is, throughout its length, a replica of the lumbo-caudal part of its superior neighbor, but it arises from the ventral portions of the terminations of the transverse processes. Craniad, it narrows and ceases at about the last rib.

*Postcostal hypaxial musculature.*—The *hypaxialis* of the lumbo-caudal region is immense, being in transverse section even more massive than the epaxial or supravertebral muscles. The pedun-

culate portion consists largely of a bundle of stout tendons, and the attachments are to the chevrons as far as these occur; to the centra; and to the ventral surface of the transverse processes. As the thorax is approached the mass rather rapidly diminishes in size and but few fibers extend craniad of the fourteenth thoracic vertebra.

Broadly speaking, this muscle seems to be very similar in those Cetacea so far investigated, although it must vary much in size. Schulte found that in *Kogia* and *Balaenoptera* it is imperfectly divisible into three parts, but the condition of the specimens of *Neomeris* did not allow of subdivision. It is undoubtedly made up of elements of the psoas, iliacus, and quadratus lumborum muscles.

#### MUSCLES OF THE ANTERIOR LIMB

As previously mentioned, the whole scapula is encased in a tough, membranous sheet of tissue, and it is to this, and not upon the bone, that the muscles are attached.

The *deltoides* is enormous, arising from the scapular membrane along the entire vertebral border. As it passes distad, numerous bundles of tendinous fibers develop upon the superficial belly, and insertion is not only across the whole of the lateral aspect of the humerus, just distad to the center of the shaft, but around both borders and barely onto the medial aspect of the bone. The extent of this muscle is thus over the entire lateral face of the scapula and all but the distal part of the lateral humerus as well. There is no subdeltoides.

Instead of covering every other muscle of the scapula save a very small portion of the teres major, the deltoid of *Kogia* and *Balaenoptera* overlies but two-fifths to a half of the dorso-lateral portion of the scapula, but in *Globiocephala* it is practically as extensive as in *Neomeris*. The insertion in the former genus is not given, but in *Kogia* and *Balaenoptera* it is less extensive.

The *supraspinatus* is rather small, originating from the scapular membrane over the supraspinous fossa but not approaching the vertebral border. Insertion is along the cranial border of the head of the humerus. It passes beneath the acromion but has no true attachment to that process.

In *Kogia* this muscle seems to be smaller and originates chiefly from the medial aspect of the enormous acromion instead of from the scapula proper. In *Balaenoptera*, *Globiocephala*, and *Phocaena*, however, it arises from the usual supraspinous fossa.

The *infraspinatus* originates from the scapular membrane over a rather irregular area, which approaches the vertebral border only at the glenovertebral angle, and is quite widely separated from the



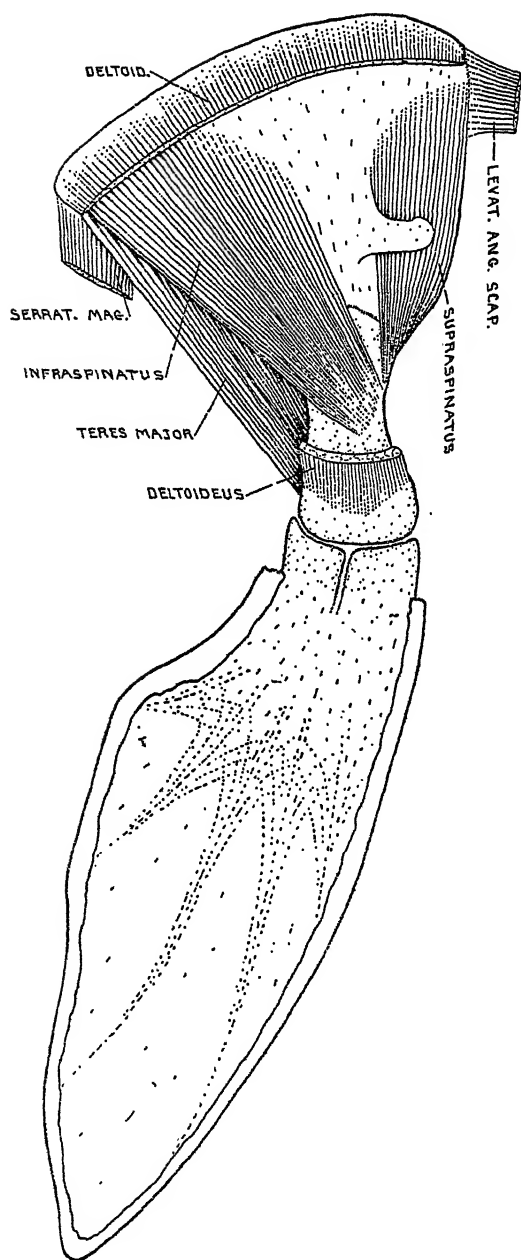


FIG. 12.—LATERAL MUSCULATURE OF THE RIGHT FORE LIMB OF NEOMERIS, SHOWING ALSO THE ARRANGEMENT OF THE DIGITAL FIBROUS TISSUE

supraspinous fossa. The fibers converge, the muscle becomes partly tendinous, and passes over the head of the femur to insertion into the craniolateral infrapinnous fossa of the humerus.

In *Kogia* this muscle is very similar but the insertion is shown as being located slightly more caudad, and is probably weaker. In *Balaenoptera* the origin occupies the middle of the lateral aspect of the scapula and the insertion is more proximad. It is not fully described nor figured for *Globiocephala*.

The *teres major* has origin from the scapular membrane along the axillary border of the scapula adjoining the glenovertebral angle,

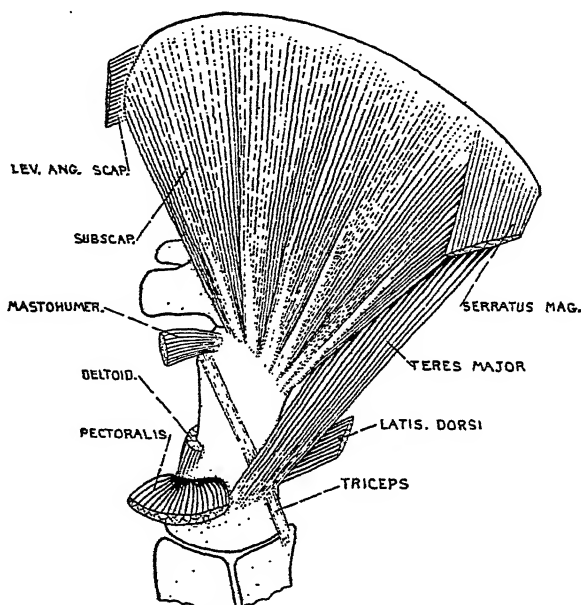


FIG. 13.—MEDIAL MUSCULATURE OF THE RIGHT FORE LIMB OF NEOMERIS

and is inserted upon the caudo-distal part of the medial shaft of the humerus.

In *Kogia* this muscle is apparently somewhat similar, but origin extends a bit farther toward the glenoid fossa; and the insertion is not shown in the illustration. In *Balaenoptera* the origin is much more extensive, and forms a considerable area over the more caudal part of the lateral aspect of the scapula.

The *subscapularis* has origin from the scapular membrane near its vertebral border and covers the entire medial aspect of the scapula. It develops strong tendon bundles upon its superficial (medial) belly, but the deeper part is entirely fleshy, and insertion is obliquely upon the tuberosity of the humerus and distad, after the

manner indicated in Figure 13. In the other cetaceans it seems to be very similar.

The humeral head of the *triceps* is represented by a remnant of tendon which extends from the cranial portion of the medial tuberosity of the humerus just distad of the attachment of the masto-humeralis, to the olecranon process of the ulna.

There is no muscle attached to either the acromion or the coracoid process, and the remnant of a triceps is the only muscle extending distad of the humerus. The limb of *Neomeris* is, therefore, unique among the cetaceans so far dissected in having the musculature of this member so simple, in this respect indicating a very specialized condition. The radius and ulna are invested in a thin layer of fibro-cartilage that is extremely tough. In spite of careful search, nothing that could be interpreted as the vestige of any other muscle of the flipper was encountered.

After removal of the integument from the fore limb it is seen that the fibro-cartilage is arranged in a definite manner, as suggested in Figure 12. The fibers converge distad from the base of each digit and the digit on either side adjoining, this suggesting the appearance of the plates of cancelloid tissue within the extremities of the larger limb bones of most mammals. Just as the latter are arranged to withstand stresses from the directions in which these are usually applied, so it may be presumed that the fibrous tissue of the cetacean flipper has a definite plan for strengthening this member.

#### PELVIC MUSCULATURE

There is apparently no levator ani in *Neomeris* such as is shown by Schulte for *Kogia*, but placed almost similarly is a *levator vulvae*, originating from the membranous sheath of the pelvic bone and inserting into the tissue about the vulva. It lies superficial to a part of the *ischiocaudalis*. This also originates from the pelvic sheath, with fibers running caudo-ventrad to the midventral line. It is shown for *Kogia* and corresponds at least in position and direction with the coccygeus of *Balaenoptera*.

There is a muscle corresponding in position to the *ischiocavernosus* as given for *Kogia*. It arises from the pelvic sheath, its fibers interdigitating with those of the rectus abdominis. I doubt if the true ischiocavernosus is as distinct in the female as is this muscle, but it is so termed provisionally.

The deeper parts of the muscles of the anal region were much hardened for some reason, and they were mutilated by the median incision made before the specimens were immersed in the preservative. For these reasons my dissection here was unsatisfactory and no attempt was made to homologize these muscles.

## OTHER SOFT PARTS

*Blowhole.*—The blowhole was investigated by cutting thin, horizontal sections from this portion of the head. As the thin, integumentary blubber layer is removed, one encounters upon either side and cranio-laterad to the blowhole proper, a superficial narial dilation or respiratory sac, measuring some 40 mm. in a transverse and 30 in a sagittal direction. It is lined with sooty mucous membrane, the more dorsal portion of which is but slightly wrinkled, while the ventral surface, more especially mediad, is thrown into heavy folds. It is separated from a similar sac upon the opposite side by a thin, membranous partition. In this plane it is not continuous with the blowhole, access to the latter being by a deeper passage situated between two of the rugose folds and extending caudo-ventrad (fig. 14).

Deep to this, on either side, is a second but smaller respiratory sac separated from the more superficial one by a thin layer of fibers of the dilator naris. It is lined with delicate, pink, mucous membrane which becomes sooty toward the passage with which it communicates with the blowhole. The remainder of the accessory air passages and sacs seem to have much individual variation. In the second specimen dissected the deeper respiratory sac communicated, by a passage running caudad, with the extreme lateral portion of the blowhole, and this was continuous with a communication with an accessory sac located caudad to the blowhole. In addition there was a second accessory sac caudad of the first, with passage to the caudal part of the blowhole deep to the first accessory sac, as shown by the dotted line in Figure 14. Whereas the superficial and deep respiratory sacs are flattened horizontally when collapsed (or rather not dilated), the two accessory sacs upon either side are flattened vertically in a somewhat sagittal direction.

In the first specimen dissected the deeper respiratory sac communicated directly with the more rostral accessory sac laterad to, but separate from, the blowhole, while access to the latter was had by a passage upon its caudal wall. There was no second accessory sac whatever.

Finally, there is a lateral dilation of the blowhole upon either side as indicated by the fossa encroaching upon the maxilla laterad of the anterior narial openings of the skull. In both animals the fleshy septum between the nares persisted for only a few millimeters beyond the bone, the remainder of the blowhole consisting of a single air passage without valves or other complications, save as there may be valvular action of the respiratory sacs. In the first specimen dissected the right narial opening of the skull was about 50 per cent larger than the left; in the second specimen the left was some 50 per cent larger than the right. It was naturally presumed that this

difference in size between the right and left air passages was osteological, but when 240862 had been cleaned it was surprising to find that the size of the two orifices was the same; so the discrepancy was due to differences in the soft parts of the two sides.

*Kogia* also has two respiratory sacs upon either side, and a number of small, supernumerary pouches which may correspond to the accessory sacs of *Neomeris*; but the structure of the blowhole is so much more complicated in the former animal, with its spermaceti

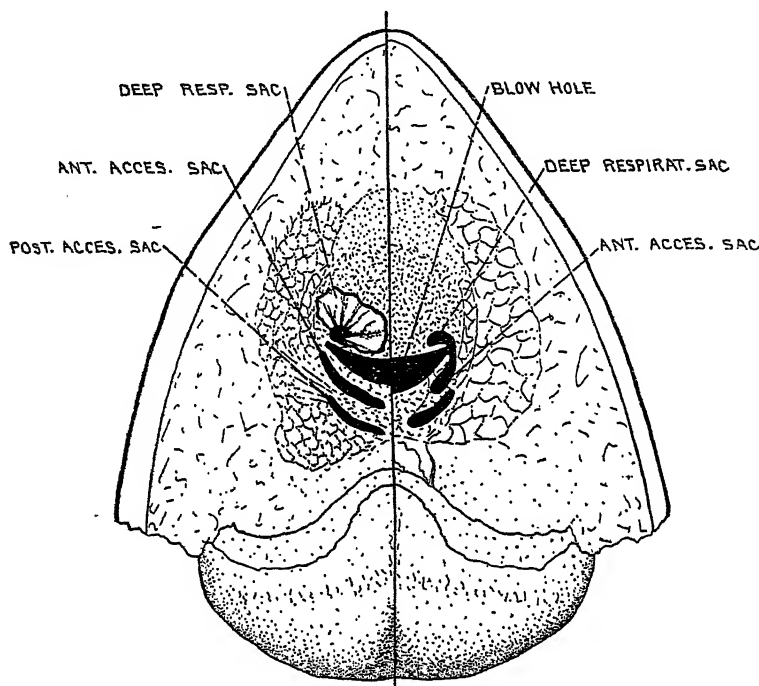


FIG. 14.—TRANSVERSE SECTIONS THROUGH THE FRONTAL REGION OF NEOMERIS:  
SECTION THROUGH DEEPER RESPIRATORY SAC AT LEFT; YET DEEPER SECTION  
AT RIGHT

organ, that comparison without a specimen is hardly profitable. The details of the blowhole of *Balaenoptera* are not illustrated, and the description is not particularly clear, but it is gathered that there is a single respiratory sac upon either side. *Globiocephala* has three pairs of sacs, but they are illustrated as being considerably different from those of *Neomeris*.

*Alimentary tract.*—The lips are rounded, leathery, and probably incapable of independent movement because of the tough, fibrous tissue beneath the integument. In the case of the juvenile at hand the teeth have not yet appeared, but there is an alveolar sulcus present. This sulcus still persisted in the immature females dissected,

although the teeth had appeared above the oral membrane. Even in old specimens, however, the teeth project above the gum to so slight an extent that they can have but little more function than as a slight aid to the holding of slippery prey.

The tongue of the preserved specimens is hard, with a smooth, flat, dorsal surface, an acute border, and somewhat wrinkled, vertical, lateral portion. It is interesting to note that on the anterior part of the acute border there is a well-developed row of papillae. These seem to be softer than the remainder of the tongue and their function is probably tactile.

No dissection of the pharynx was made, but it was noted that the epiglottis was of the type illustrated for *Globiocephala*.

The stomach is divided into four parts, but one of these is double and so it might with almost equal propriety be considered as consisting of five divisions. The esophagus enters the largest, which is ovoid and about 112 mm. in length. The outer wall is tough and rubbery with a uniform thickness of about one millimeter. The lining, which had peeled loose, was quite heavily plicated and most of it was thin, but surrounding the constricted passage to the second division it was gathered into heavy plicae with a thickness of more than 5 mm.

The second division was flat and somewhat kidney-shaped, measuring 84 by 47 by 22 mm. in thickness. This was lined with extremely heavy, chocolate-colored ridges running lengthwise, these having short rugosities projecting laterad and interdigitating in a regular manner with similar rugosities from the adjoining ridges. At two thirds the distance to the base of this division and hidden between two of the heavy folds is a constricted passage to the third division. In the preserved specimen this had a width not greater than 2 mm. From the second division this passage is absolutely undifferentiated and in spite of careful search it was only by dissecting from the third division that its existence could be demonstrated. The condition of the surrounding parts indicates that the passage is not much, if at all, extensible; and yet it must be, for otherwise the food of the animal would of necessity be limited to such items as the smallest crustaceans, and this, according to the authority of published statements, is not the case.

The third division is double, being somewhat V-shaped with smooth, rubbery lining, each part being about 44 mm. in length, the two being separated by an oval constriction some 10 mm. in greatest diameter.

The fourth division was similar in size and character to one-half of the third and was separated from the latter by another oval constriction, this being but 5 mm. in greatest diameter.

The postgastric portion of the gut was all of the same character, with a uniform width of about 10 mm. and a length of 630 cm. There are very sharply differentiated, longitudinal plications upon the entire inner surface.

The alimentary tract was not only without discernible intestinal parasites, but was absolutely empty, suggesting that the animal had been impounded for some time before it was killed.

*Mammæ.*—The slit of each mammary orifice communicates directly with a dilated mammary duct of generous proportions, this varying from 10 to 15 mm. in diameter and with a length of about 100 mm., it being directed craniad. Anteriorly it is more flattened and its walls are broken up into numerous and large galactiferous sinuses, these in turn being surrounded by mammary glandular tissue of the usual character. The large capacity of the mammary duct, size of the mammary orifice, and lack of any external prominence, as well as the presence at this point of superficial musculature, indicates that the young probably do not nurse by sucking in the accepted fashion, but rather that milk is either forced into the mouth chiefly by muscular action of the dam, or that the offspring itself does the forcing by means of butting against its mother.

Within the mammary duct was a single long, vermiform parasite, and encisted in the mammary glandular tissue were a number of smaller parasitic worms. These have not yet been identified.

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# A TAXONOMIC AND ECOLOGICAL REVIEW OF THE NORTH AMERICAN CHALCID-FLIES OF THE GENUS CALLIMOME

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## INTRODUCTION

Until careful work is done on the taxonomy of a group it is difficult to gain an adequate conception of its biology. The purpose of this study is, therefore, to establish a working basis for a certain part of the Chalcidoid complex, especially in as far as this complex pertains to galls or gall-like formations.

This study deals with 112 species of Chalcidoidea, 104 of which belong to the genus *Callimome* Spinola. Of the 104 species treated under *Callimome* 11 are unrecognized, and of the 112 species listed as Chalcidoidea 8 were wrongly classified. To accommodate these 8 species it has been necessary to transfer 6 to previously described genera and to erect 2 new genera for the other 2.

## ACKNOWLEDGMENTS

The writer wishes to express his acknowledgments to those who in some special way have given aid in the preparation of this paper. To S. A. Rohwer and A. B. Gahan for their advice and assistance while working on material deposited in the National collection, and for library facilities as well as many other courtesies shown while engaged in study in the United States National Museum, the writer wishes to express his sincere gratitude. Grateful acknowledgment is also made to Prof. Herbert Osborn for valuable suggestions. The writer further wishes to express his deep appreciation to Dr. A. C. Kinsey for the loan of Chalcidoid specimens reared from Cynipid galls. Acknowledgment of indebtedness is also due to J. McDunnough and Nathan Banks for comparing specimens with types.

## CLASSIFICATION

## Superfamily CHALCIDOIDEA

## Family CALLIMOMIDAE

## Subfamily CALLIMOMINAE

## Genus CALLIMOME Spinola

*Callimome* SPINOLA, Ann. Mus. Nat., vol. 17, 1811, pp. 146-148. Genotype, *Ichneumon bedeguaris* Linnaeus. (Designated by Curtis.)

*Misocampus* LATREILLE, Nouv. dict. hist. nat., ed. 2, 1817, p. 213.

*Torymus* DALMAN, Svensk. Vet. Akad. Handl., vol. 41, 1820, pp. 135-158.

*Syntomaspis* FÖRSTER, Hym. Stud., vol. 2, 1856, p. 43-44. Genotype, *Syntomaspis* (*eurynotus* Förster) = *cyaneus* Boheman.

*Syntomaspis* Förster, W. H. ASHMEAD, Memoirs Carnegie Museum, vol. 1, No. 4, 1904, p. 241.

Additional references used in the preparation of this paper are Dalla Torre's Catalogus Hymenopterorum, volumes 2 and 5, and Gahan and Fagan's List of Genotypes, Bulletin 124, United States National Museum, 1923.

## DESCRIPTION OF THE GENUS

The subfamily *Callimominae* is characterized, according to Dr. W. H. Ashmead (1904) by having two spurs on the hind tibiae, a hind femur which is smooth on its lower margin (except that in a few species this margin may be minutely roughened) and a very short stigmal vein. The antennae have 13 joints.

*Generic characters.*—Antenna with one ring-joint, the joints of the funicle more or less uniform; transverse cross furrow on the posterior one-third of the scutellum very deep to very inconspicuous; stigmal vein shortly petioled to sessile, and never as long as the postmarginal vein; marginal vein shorter than the submarginal; abdomen sessile.

A careful study of the generic characters as indicated, together with the characterization of the subfamily to which the genus belongs, should make it easily possible to recognize the genus *Callimome*. In addition to these characters a knowledge of the habitus of the genus is often of special value in giving a clear perspective. As is true apparently of the majority of the species belonging to the subfamily *Callimominae*, the most of the species belonging to the genus *Callimome* are parasitic on gall making or gall inhabiting insects. Exceptions to this general rule are a few species which are phytophagous. While it is quite likely that the majority of the still undiscovered and undescribed species will belong to the truly parasitic group rather than the phytophagous group, yet it is not improbable that many species having the phytophagous habit or some variation of this habit will be discovered later. It is to be expected, too, that we will

find still other species with habits that will tend to connect these two habitus groups which now seem to be more or less widely divergent.

#### NOMENCLATURE AND TAXONOMY

The genus *Callimome* was erected in 1811 by Spinola. *Misocampus* Latreille and *Torymus* Dalman are both isogenotypic with *Callimome* Spinola.<sup>1</sup> *Syntomaspis* Förster has been distinguished from the other genera chiefly by the presence or absence of a transverse cross furrow on the apical portion of the scutellum. In this study the value of the cross furrow has been carefully considered not only as it stands by itself, but also in combination with other characters. My conclusion, after having examined over 100 species and several hundred specimens, is that this cross furrow should not be considered as of generic value.

The cross furrow varies in two different ways: 1. In a series of individuals of the same species it is often found that many specimens have a cross furrow which can be seen very easily, while others of the series seem to have none at all. The character is inconstant even in specimens reared from the same host and quite probably the offspring of the same parents. 2. The character varies in different species. In some it is very marked, while in other it is discernible only at certain angles, due apparently to a difference in the sculpture of the scutellum.

The genotype of *Syntomaspis* Förster (*Syntomaspis eurynotus* Förster) has a very deep and very distinct cross furrow on the scutellum. The genotype of *Callimome* (= *Torymus*) (*Ichneumon bedeguaris* Linnaeus) also has a very deep and very distinct cross furrow. It is apparent, therefore, that this character can not be used to separate these genera.

Primarily there are two types of stigmal veins—sessile and petioled. (See figs. 1–100.) Attention is called here to the fact that both of the genotypes mentioned above have a petioled stigmal vein. Examination of many individuals of a species indicates that the types of stigmal veins are practically constant. However, if the type of stigmal vein were used as a generic character it would necessitate the erection of a new genus to include those species which have the stigmal vein sessile. A study of the drawings alone might lead to the conclusion that differences in the stigmal vein are sufficiently distinct to be of generic value. However, in some cases it is not easy to distinguish between a petioled and a subsessile vein, for it is not a long step from a subsessile to a petiolate condition. Furthermore it is not illogical to expect that with the discovery of new species some will be found to bridge this gap.

<sup>1</sup> Gahan and Fagan. Bull. 124, U. S. Nat. Mus., 1923, pp. 26 and 91.

The genotypes of *Syntomaspis* and *Callimome* (= *Torymus*) agree in essential generic characters, and since the available morphological characters and biological information do not justify the erection of a new genus, I have chosen to treat the whole complex under the name *Callimome*.

#### DISTRIBUTION

*Geological*.—That *Callimome* Spinola is not a recent group is evidenced by the fact that Brues<sup>2</sup> records fossil remains of a specimen which he assigned to this genus. *Callimome bruesi*, new name for *Torymus sackeni* Brues, preoccupied by *Torymus sackeni* Ashmead, was found in the Lower Oligocene in the Florissant shales, Colorado. It is a very large species and in some respects is said to resemble *Callimome magnificum* Osten Sacken.

*Geographical*.—It is possibly safe to say that representatives of this genus will ultimately be found wherever gall insects and their plant hosts are abundant. This paper includes species from Alaska, Canada, Mexico, West Indies, Japan, South America, and 27 States of the United States. Those from South America and Japan are listed here only because they are in the National collection.

#### HOST RELATIONSHIPS

It is very evident, as may be seen from a study of the host index, that the majority of the species of the genus *Callimome* are parasites of either Hymenopterous or Dipterous gallmakers. It will be noted, too, that in the specific key the genus is divided into two groups, namely Group A and Group B. The species of the first group greatly prefer Cynipidae as hosts, while those belonging to Group B show a preference for the Itonidae. Concerning the species for which we have complete data it is found that in Group A, 27 species have Cynipid hosts and 10 species have Dipterous hosts. In Group B, 13 species were reared from Cynipid galls and 15 species from Dipterous hosts. In this connection it is interesting to note, that of the species of Group A, which prefer Cynipid hosts, 24 were reared from galls on *Quercus*<sup>3</sup>; and of the 13 species of Group B, which prefer Cynipid hosts, 11 species were reared from galls on *Rubus* or *Rosa*.

The phytophagous habits of some of the species of *Callimome* deserve special attention at this time. Five species have been recorded as either wholly or partially phytophagous. Whether they have inherited this phytophagous habit from the earliest ancestors, which can be assumed to have been phytophagous, or whether they have become phytophagous after having passed through a parasitic or semi-

<sup>1</sup> Parasitic Hymenoptera of the Tertiary of Florissant, Colorado. Bull. Mus. Comp. Zool., vol. 54, No. 1, p. 17, 1910.

<sup>2</sup> This paper was submitted before the recent revision of the species of oaks by Prof. William Trelease appeared and throughout the paper the old names for species of *Quercus* are used.

parasitic stage, is a matter of considerable speculation. Gahan<sup>4</sup> in a recent paper discusses the development of phytophagy in Chalcidoids and seems to have arrived at the conclusion that phytophagy is probably a recent development.

Two of the apparently phytophagous species are found in North America. *Callimome druparum* (Boheman), also found in Europe, is the only one in North America that is definitely known to be phytophagous. The larvae of this species feed upon the seeds of apple (*Pyrus*) and of the mountain ash (*Sorbaria*). *Callimome amelanchieris* (Cushman) was reared from seeds of *Amelanchier canadensis* (Linnaeus) Medicus. Cushman<sup>5</sup> thinks it is doubtfully phytophagous and suggests that it may sometimes be parasitic on a species of *Megastigmus*.

*Callimome advenum* Osten Sacken is one of the most unique of all in its host relationships. It seems to be a parasite of a Cynipid gall maker as well as three different species of Dipterous gall makers; it was also reared from the seeds of *Amelanchier canadensis* in the same lot of material as *Callimome amelanchieris* (Cushman). Whether it is truly phytophagous can not be stated at this time.

A species apparently overlooked until the present time and which may be phytophagous, is *Callimome thompsoni*, (Fyles) which has been reported as ovipositing in plums.

#### HOSTS OF THE SPECIES OF CALLIMOME

Dalla Torre's Catalogus Hymenopterorum (volumes 2 and 5) has served as a guide in the preparation of this list. As will be noted in the following pages, the hosts have been listed under five headings, namely, Hymenoptera, Diptera, Homoptera, Phytophagous, and Miscellaneous.

Host	HYMENOPTERA	
		Parasite
<i>Amphibolips acuminata</i> Ashmead.....	<i>Callimome melanocerae</i> Ashmead.	
<i>Amphibolips championi</i> (Cameron) Ashmead .....	<i>Callimome mexicanum</i> (Ashmead).	
<i>Amphibolips cinerea</i> Ashmead .....	<i>Callimome coeruleum</i> Ashmead.	
<i>Amphibolips citriformis</i> (Ashmead) Dalla Torre .....	<i>Callimome melanocerae</i> Ashmead.	
<i>Amphibolips coccinea</i> (Osten Sacken) Ashmead .....	<i>Callimome coccineum</i> Huber; <i>melanocerae</i> Ashmead; <i>tubicola</i> Osten Sacken.	
<i>Amphibolips confluentis</i> (Harris) Cresson.	<i>Callimome coccineum</i> Huber; <i>racemareae</i> Ashmead.	
<i>Amphibolips fuliginosa</i> Ashmead.....	<i>Callimome racemareae</i> Ashmead; <i>robustum</i> Huber.	
<i>Amphibolips gainesi</i> Bassett.....	<i>Callimome racemareae</i> Ashmead.	

<sup>4</sup> Gahan, A. B. List of Phytophagous Chalcidoidea with descriptions of two new species, Proc. Ent. Soc. Wash., vol. 24, No. 2, 1922.

<sup>5</sup> Cushman, R. A. The Apple Seed Chalcid, Journ. Agr. Res., vol. 7, No. 11, U. S. D. A., 1916.

Host	Parasite
<i>Amphibolips globulus</i> Beutenmueller.....	<i>Callimome melanocerae</i> Ashmead; <i>racemareae</i> Ashmead; <i>tubicola</i> Osten Sacken.
<i>Amphibolips inanis</i> (Osten Sacken) Mayr.	<i>Callimome melanocerae</i> Ashmead; <i>racemareae</i> Ashmead.
<i>Amphibolips melanocerae</i> (Ashmead).....	<i>Callimome melanocerae</i> Ashmead.
<i>Amphibolips prunus</i> (Walsh) Mayr.....	<i>Callimome racemareae</i> Ashmead.
<i>Amphibolips racemaria</i> Ashmead.....	<i>Callimome racemareae</i> Ashmead.
<i>Amphibolips trizonata</i> Ashmead.....	<i>Callimome bicoloratum</i> Huber.
<i>Amphibolips</i> , species.....	<i>Callimome cinerosum</i> Huber.
<i>Andricus californicus</i> (Bassett) Mayr....	<i>Callimome californicum</i> (Ashmead).
<i>Andricus californicus-californicus</i> Kinsey	<i>Callimome californicum</i> (Ashmead).
<i>Andricus californicus-glabrescens</i> Kinsey	<i>Callimome californicum</i> (Ashmead).
<i>Andricus castanopsidis</i> Beutenmuller....	<i>Callimome castanopsidis</i> Huber.
<i>Andricus championi</i> (Cameron) Ashmead	<i>Callimome mexicanum</i> (Ashmead).
<i>Andricus flocci</i> (Walsh) Osten Sacken...	<i>Callimome aeneum</i> Ashmead; <i>melanocerae</i> Ashmead; <i>tubicola</i> Osten Sacken.
<i>Andricus operator</i> (Osten Sacken) Mayr.	<i>Callimome tubicola</i> Osten Sacken.
<i>Andricus pacificus</i> Ashmead.....	<i>Callimome californicum</i> (Ashmead); <i>giganticum</i> Huber.
<i>Andricus petiolicola</i> (Bassett) Osten Sacken.	<i>Callimome tubicola</i> Osten Sacken.
<i>Andricus pomiformis</i> (Bassett) Ashmead	<i>Callimome californicum</i> (Ashmead).
<i>Andricus seminator</i> (Harris) Osten Sacken	<i>Callimome tubicola</i> Osten Sacken.
<i>Andricus singularis</i> (Bassett) Mayr....	<i>Callimome tubicola</i> Osten Sacken.
<i>Andricus tubicola</i> (Osten Sacken) Mayr.	<i>Callimome tubicola</i> Osten Sacken.
<i>Andricus virens</i> (Ashmead).....	<i>Callimome aeneum</i> Ashmead; <i>sackeni</i> Ashmead.
<i>Argidae</i> , species.....	<i>Callimome tubicola</i> Osten Sacken.
<i>Callirhytis q-agrifoliae</i> (Bassett).....	<i>Callimome fullawayi</i> Huber.
<i>Callirhytis rossi</i> Kieffer.....	<i>Callimome californicum</i> (Ashmead).
<i>Cynips ficus</i> (Fitch) Osten Sacken.....	<i>Callimome elegantissimum</i> (Ashmead).
<i>Diastrophus cuscuteaeformis</i> Osten Sacken	<i>Callimome duplicatum</i> Huber.
<i>Diastrophus nebulosus</i> Osten Sacken....	<i>Callimome advenum</i> Osten Sacken; <i>flavicozum</i> Osten Sacken; <i>sackeni</i> Osten Sacken.
<i>Diastrophus turgidus</i> Basset.....	<i>Callimome sackeni</i> Osten Sacken.
<i>Diastrophus</i> , species.....	<i>Callimome flavicozum</i> Osten Sacken.
<i>Diplolepis bassetti</i> (Beutenmueller) Kinsey	<i>Callimome chrysochlora</i> Osten Sacken.
<i>Diplolepis californica</i> Kinsey.....	<i>Callimome chrysochlora</i> Osten Sacken.
<i>Diplolepis ignota</i> (Osten Sacken) Kinsey	<i>Callimome chrysochlora</i> Osten Sacken.
<i>Diplolepis rosae</i> (Linnaeus) Kinsey.....	<i>Callimome chrysochlora</i> Osten Sacken.
<i>Disholcaspis corallina</i> (Bassett).....	<i>Callimome californicum</i> (Ashmead); <i>californicum</i> variety <i>subdolum</i> Huber; <i>giganticum</i> Huber.
<i>Disholcaspis chrysolepidis</i> Beutenmueller.	<i>Callimome californicum subdolum</i> Huber.
<i>Disholcaspis cinerosa</i> Bassett.....	<i>Callimome cinerosum</i> Huber; <i>racemareae</i> Ashmead; <i>warreni</i> Cockerell.

Host	Parasite
<i>Dischalcaspis fasciata</i> Basset	<i>Callimome aereum</i> Huber; <i>racemareae</i> Ashmead.
<i>Dischalcaspis ficigera</i> (Ashmead)	<i>Callimome elegantissimum</i> (Ashmead).
<i>Dischalcaspis floridana</i> (Ashmead)	<i>Callimome aeneum</i> Ashmead.
<i>Dischalcaspis globulus</i> Fitch	<i>Callimome melanocerae</i> Ashmead; <i>racemareae</i> Ashmead; <i>tubicola</i> Osten Sacken.
<i>Dischalcaspis maculipennis</i> Gillette	<i>Callimome californicum</i> (Ashmead); <i>giganticum</i> Huber; <i>perplexum</i> Huber.
<i>Dischalcaspis omnivora</i> (Ashmead)	<i>Callimome aeneum</i> Ashmead.
<i>Dischalcaspis plumella</i> Kinsey	<i>Callimome californicum</i> (Ashmead).
<i>Dischalcaspis polita</i> Bassett	<i>Callimome melanocerae</i> Ashmead.
<i>Dischalcaspis rubens</i> Gillette	<i>Callimome rubenidis</i> Huber; <i>warreni</i> (Cockerell).
<i>Dischalcaspis rugosa</i> (Bassett)	<i>Callimome racemareae</i> Ashmead.
<i>Dischalcaspis simulata</i> Kinsey	<i>Callimome californicum</i> (Ashmead).
<i>Dischalcaspis sponiosa</i> Karsch	<i>Callimome warreni</i> (Cockerell).
<i>Dischalcaspis terrestris</i> Weld	<i>Callimome melanocerae</i> Ashmead; <i>racemareae</i> Ashmead.
<i>Dischalcaspis truckeensis</i> Ashmead	<i>Callimome</i> (Ashmead); <i>californicum-subdolum</i> Huber.
<i>Megastigmus</i> , species	<i>Callimome amelanchieris</i> (Cushman).
<i>Neuroterus minutissimus</i> Ashmead	<i>Callimome neuroterum</i> (Ashmead).
<i>Neuroterus catesbaei</i> (Ashmead) Cresson	<i>Callimome dryophantae</i> (Ashmead).
<i>Philonix pezomachoides</i> (Osten Sacken)	<i>Callimome brodiei</i> (Ashmead).
<i>Rhodites (Lytorhodites) arefactus</i>	<i>Callimome chrysochlora</i> Osten Sacken.
<i>Rhodites bicolor</i> Harris	<i>Callimome bicoloratum</i> Huber.
<i>Rhodites dichloceros</i> (Harris) Osten Sacken	<i>Callimome chrysochlora</i> Osten Sacken.
<i>Rhodites multispinosus</i> Gillette	<i>Callimome chrysochlora</i> Osten Sacken.
<i>Rhodites radicum</i> Osten Sacken	<i>Callimome flavicoxum</i> Osten Sacken; <i>magnificum</i> Osten Sacken.
<i>Rhodites variabilis</i> Bassett	<i>Callimome chrysochlora</i> Osten Sacken.
<i>Rhodites</i> , species	<i>Callimome rhoditidis</i> Huber.
<i>Rhodites</i> , species	<i>Callimome rosae</i> Huber.
Cynipidae	<i>Callimome cruentatum</i> Huber.
Cynipidae	<i>Callimome gahani</i> Huber.
Cynipidae	<i>Callimome hirsutum</i> Huber.
Cynipidae	<i>Callimome minutissimum</i> Huber.
Cynipidae	<i>Callimome osborni</i> Huber.
<i>Harmolita</i> , species	<i>Callimome rohweri</i> Huber.
<i>Harmolita</i> , species	<i>Callimome thalassinum</i> (Crosby).

## DIPTERA

<i>Asphondylia conspicua</i> Osten Sacken	<i>Callimome advenum</i> Osten Sacken.
<i>Asphondylia websteri</i> Felt	<i>Callimome hainesi</i> (Ashmead); <i>sativae</i> , new name.
<i>Asphondylia</i> , species	<i>Callimome tricolor</i> Huber.
<i>Cecidomyia</i> , species	<i>Callimome advenum</i> Osten Sacken.
<i>Cecidomyia</i> , species	<i>Callimome koebeleri</i> Huber.
<i>Cecidomyia</i> , species	<i>Callimome asteridis</i> Huber.
<i>Cecidomyia</i> , species	<i>Callimome atriplicis</i> Huber.
<i>Cecidomyia</i> , species	<i>Callimome baccharidis</i> Huber.



Host	Parasite
<i>Cecidomyia</i> , species .....	<i>Callimome capillaceum</i> Huber.
<i>Cecidomyia</i> , species .....	<i>Callimome cecidomyiae</i> Walker.
<i>Cecidomyia</i> , species .....	<i>Callimome coloradensis</i> Huber.
<i>Cecidomyia</i> , species .....	<i>Callimome dubiosum</i> Huber.
<i>Cecidomyia</i> , species .....	<i>Callimome hircinum</i> Ashmead.
<i>Cecidomyia</i> , species .....	<i>Callimome kinseyi</i> Huber.
<i>Cecidomyia</i> , species .....	<i>Callimome longistigmum</i> Huber.
<i>Cecidomyia</i> , species .....	<i>Callimome mellipes</i> Huber.
<i>Cecidomyia</i> , species .....	<i>Callimome missouriensis</i> Huber.
<i>Cecidomyia</i> , species .....	<i>Callimome occidentale</i> Huber.
<i>Cecidomyia</i> , species .....	<i>Callimome ochreatum</i> (Say).
<i>Cecidomyia</i> , species .....	<i>Callimome persimilis</i> (Ashmead).
<i>Cecidomyia</i> , species .....	<i>Callimome solidaginis</i> Huber.
<i>Cecidomyia</i> , species .....	<i>Callimome umbilicatum</i> (Gahan).
<i>Cecidomyia</i> , species .....	<i>Callimome multicolor</i> Huber.
<i>Dasyneura almea</i> Felt .....	<i>Callimome dasyneurae</i> Huber.
<i>Dasyneurae rosarum</i> Hardy .....	<i>Callimome sackeni</i> Osten Sacken.
<i>Dasyneurae serrulatae</i> Osten Sacken .....	<i>Callimome sackeni</i> Osten Sacken.
<i>Diplosis caryae</i> Osten Sacken .....	<i>Callimome durum</i> Osten Sacken.
<i>Euaresia tricolor</i> Doane .....	<i>Callimome citripes</i> Huber.
<i>Lasioptera vitis</i> Osten Sacken .....	<i>Callimome ebrium</i> Osten Sacken.
<i>Lasioptera</i> , species .....	<i>Callimome capite</i> Huber.
<i>Oedaspes atra</i> Loew .....	<i>Callimome advenum</i> Osten Sacken.
<i>Rhabdophaga strobiloides</i> Walsh .....	<i>Callimome strobiloides</i> Huber.

## HOMOPTERA

<i>Pachysylla gemma</i> Riley .....	<i>Callimome scalaris</i> Huber.
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## PHYTOPHAGOUS

Seeds (Pyrus) .....	<i>Callimome druparum</i> (Boheman).
Seeds (Amelanchier) .....	<i>Callimome prunicola</i> Huber.
Cherry .....	<i>Callimome prunicola</i> Huber.
Plum .....	<i>Callimome thompsoni</i> (Fyles).

## MISCELLANEOUS

<i>Prosoma</i> , species .....	<i>Callimome pilularidis</i> Huber.
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## SPECIFIC CHARACTERS

For specific characters in a group sense, the length of the stigmal vein, the depth of the cross furrow on the scutellum, and the type of punctation on the dorsum are all valuable. In Group A the punctures are very deep and wide in some species, while in others they are very minute. In a few species the thoracic dorsum is entirely reticulate, or reticulato-punctate. The length and type of hair covering are of especial worth in many instances. Two of the very best of structural characters are the comparative length of the joints of the antenna, and the comparative distances between the ocelli, and the ocelli and eye margins. The comparative size of individuals as well as the size and shape of the head, parts of the legs, and the length of the ovipositor are of unquestionable specific worth. It must be

remembered, however, that the very nature of the habits of the parasites may considerably affect their size. It is not unusual to find individuals of the same species two or more times as large as others. The sculpture of the propodeum is also a very valuable character. In many species color alone may be safely used, but in most instances it should be supported by structural differences.

KEY TO THE SPECIES OF *CALLIMOME*

- |  |                                       |
|--|---------------------------------------|
| A. Fossil .....  | No. 1 <i>bruesi</i> Huber.            |
| Not as above .....   | B                                     |
| B. Females .....   | 2                                     |
| Males <sup>6</sup> .....   | 84                                    |
| 2. Stigmal vein petioled. Group B. ....  | 3                                     |
| Stigmal vein sessile, sometimes subsessile. Group A. ....  | 37                                    |
| 3. Scutellum with a readily conspicuous transverse cross furrow on the apical one-third. ....  | 4                                     |
| Scutellum with cross furrow hardly visible or seen only with difficulty. ....  | 8                                     |
| 4. Fore wings with a conspicuous brown area adjacent to stigmal knob. ....   |                                       |
|  | No. 1a <i>fullawayi</i> Huber.        |
| Fore wings clear, without such a brown area. ....  | 4a                                    |
| 4a. Front femora greatly swollen, almost as wide as the hind femora; legs and scape entirely yellow; propodeum with a median longitudinal depression. ....   | No. 2 <i>persimilis</i> (Ashmead).    |
| Front femora normal; coxae never yellow. ....  | 5                                     |
| 5. Body large, 4 to 5 mm.; ovipositor as long or a little longer than the body; scape brown with tint of green; scutellar apex very highly polished; legs, except coxae and hind femora yellow-tesaceous. ....   |                                       |
|  | No. 3 <i>druparum</i> (Boheman).      |
| Body small, not more than 3 mm. ....   | 6                                     |
| 6. Thorax and abdomen a distinct brownish bronze; legs, scape, and flagellum a waxy, uniform light brown; funicle joints not much longer than wide, the last two wider than long and almost twice as wide as the first; ovipositor as long as abdomen; cross furrow moderate. .... |                                       |
|  | No. 4 <i>scalaris</i> Huber.          |
| Thorax green; legs darker and not uniform in color, the scutellar furrow deep; scutellar apex shining. ....  | 7                                     |
| 7. Hind femora mostly brown with a very slight greenish tinge, coxae and other femora brown; ovipositor about five-sevenths as long as the body; uncus of stigmal vein three-fourths as long as diameter of knob. ....   |                                       |
|  | No. 5 <i>sulcatum</i> Huber.          |
| Hind femora, coxae and abdomen dark green; hind tibiae dark brown; ovipositor same length as abdomen; uncus of stigmal vein longer than the diameter of knob. ....   | No. 6 <i>amelanchieris</i> (Cushman). |
| 8. Sclerite above the tegulae and at the posterior portion of the mesepimeron brassy; thorax greenish-blue. ....   | No. 7 <i>rudbeckiae</i> (Ashmead).    |
| Sclerites above tegulae never brassy. ....   | 9                                     |
| 9. Thorax brilliant blue; abdomen deep, shining, purplish-blue, with an under-shade of violet; scape yellowish-green below, brownish above; last three joints of funicle wider than long; legs and fore coxae honey-yellow, except the base of coxae. ....                         | No. 8 <i>mellipes</i> Huber.          |
| Not as above. ....   | 10                                    |

<sup>6</sup> The males of *ebrium* Osten Sacken, *areum*, new species, *occidentale*, new species, and *holcaspoides* (Ashmead) are not included in this key. All other species which are known in the male are included.

10. Thorax ventrally bright yellow..... 11  
 Thorax never yellow ventrally..... 12
11. Ovipositor longer than abdomen; mesoscutum greenish.  
     No. 9 *ebrium* Osten Sacken.  
 Ovipositor one-third as long as abdomen; dorsum with a yellowish to a greenish tint... No. 10 *dubiosum* Huber; No. 11 *durum* Osten Sacken (male only).
12. Head, thorax and abdomen very densely clothed with a fine, silky, grayish pubescence, the abdomen less densely clothed, except at the tip; legs, except the coxae, yellow; ovipositor longer than the abdomen.  
     No. 12 *hircinum* (Ashmead).  
 Body clothed with hairs but never so densely as above..... 13
13. Abdomen with a very distinct yellow band; coxae yellow, except a green spot on the base, rest of legs and scape yellow; body 3 to 4 mm. .... 14  
 Abdomen not as above..... 16
14. Ovipositor as long or longer than the body; pedicel and first joint of funicle about equal in length..... No. 13 *flavicoxum* Osten Sacken.  
 Ovipositor scarcely longer than abdomen..... 15
15. First joint of funicle almost as long as the pedicel and ring-joint combined; ring-joint about one and one-half times as long as wide.  
     No. 14 *fulvum* Huber.  
 First joint of funicle a little shorter than the pedicel, all funicle joints of equal length and hardly longer than wide; band on abdomen well defined dorsally..... No. 15 *duplicatum* Huber.
16. Propodeum carinate and roughly sculptured..... 17  
 Propodeum not carinate, smooth..... 18
17. Ovipositor as long or just a little longer than the abdomen or about four-sevenths as long as the body, which is 3 mm.; pedicel one-third longer than first joint of funicle..... No. 16 *alamedensis* Huber.  
 Ovipositor distinctly shorter than the abdomen and less than one-half as long as the body which is about 3.5 mm.; pedicel and first funicle joint about equal in length..... No. 17 *sackeni* Ashmead.
18. Abdomen very sharply carinate and compressed; antennae black, the scape greenish-black; joints of funicle wider than long except the first; ovipositor shorter than abdomen..... No. 18 *alaskensis* Huber.  
 Abdomen and antennae not as above..... 19
19. Head greatly enlarged, one-half as thick as wide and nearly round as seen from the front; thorax very elongate and narrow; ovipositor longer than abdomen..... No. 19 *capite* Huber.  
 Head distinctly tranverse..... 20
20. Femora, tibiae and tarsi uniformly dark testaceous, coxae green or greenish-brown; scape never dark brown or green; joints of funicle as wide as long; body normally about 2 mm. long..... 21  
 Legs never uniformly dark testaceous..... 23
21. Ovipositor three-fourths as long as abdomen; coxae and abdomen dark green..... No. 20 *ferrugineipes* Huber.  
 Ovipositor a little longer than abdomen..... 22
22. Fore coxae brownish, the hind ones darker; abdomen brown with a green tinge..... No. 21 *rhoditidis* Huber.  
 Fore coxae yellow, others brown to green; scape pedicel and ring-joint testaceous..... No. 22 *sylvicolum* (Ashmead).
23. All joints of funicle distinctly longer than wide..... 24  
 Some joints of funicle wider than long..... 29

24. Scape green, brown, or partly brown and partly yellow, never entirely yellow ..... 25  
 Scape yellow ..... 28
25. Scape entirely dark green; ovipositor one-third as long as abdomen.  
 No. 23 *aeneoscapum* Huber.  
 Scape never as above ..... 26
26. Ocellocular line nearly twice the length of the long diameter of posterior ocellus and one-fourth longer than the post ocelli line; femora strongly infusate on outside; scape yellowish beneath ..... No. 24 *rosae* Huber.  
 Ocellocular line not much more than equal to the length of long diameter of posterior ocellus ..... 27
27. Body elongate; abdomen narrow and purplish; ovipositor always longer than the body which is about 4.5 mm. .... No. 25 *magnificum* Osten Sacken.  
 Body short, robust; abdomen green, the tip often copperish; ovipositor generally shorter than the body which is about 4 mm.  
 No. 26 *chrysochlora* Osten Sacken.  
 Body narrow and about 4 mm.; abdomen green to golden green.  
 No. 27 *tubularis* Huber.
28. Ovipositor a little longer than the body; abdomen purplish; fore coxae greenish-yellow, other coxae green and rest of legs yellow.  
 No. 28 *strobiloides* Huber.  
 Ovipositor distinctly shorter than the body; abdomen green, fore coxae yellow, other coxae green and rest of legs yellow.  
 No. 29 *sapporensis* (Ashmead);  
 No. 30 *japonicum* (Ashmead) (male only).
29. Scape entirely yellow; ovipositor never as long as the body and not much longer than abdomen ..... 30  
 Scape entirely dark ..... 33  
 Scape with the under side yellow, the tip above dark ..... 35
30. Abdomen ferruginous-yellow ventrally; legs, except the hind coxae, yellow; flagellum very black, and the last two or three joints wider than long.  
 No. 31 *flaviventre* (Ashmead).  
 Abdomen and flagellum never as above ..... 31
31. Hind tibiae infusate in the middle; ovipositor a little longer than the abdomen ..... No. 32 *missouriensis* Huber.  
 Hind tibiae yellow, not infusate ..... 32
32. Fore coxae orange yellow; scape same color ..... No. 33 *asteridis* Huber.  
 Fore coxae green ..... No. 34 *atriplicis* Huber.
33. Ovipositor about as long as body which is about 3 mm.; dorsum of thorax dark green with a strong reddish-coppery tinge ..... No. 35 *kinseyi* Huber.  
 Ovipositor as long or shorter than abdomen ..... 34
34. Femora and tibiae brown on outside ..... No. 36 *pilularidis* Huber.  
 Femora and tibiae testaceous ..... No. 37 *baccharidis* Huber.
35. None of the joints of funicle longer than wide, the first three about as long as wide; ocellocular line twice the length of the long diameter of posterior ocellus ..... No. 38 *longistigmum* Huber.  
 Funicle joints not as above, some longer than wide; ocellocular line never twice the length of long diameter of post-ocellus and never much more than as long ..... 36
36. Femora and tibiae testaceous; eyes pinkish ..... No. 39 *citripes* Huber.  
 Femora and hind tibiae infusate; ocelli maroon.  
 No. 40 *coloradensis* Huber.

37. Wings with a dusky area in middle; body 5 mm.; ovipositor longer than body.....No. 41 *perplexum* Huber.  
Wings entirely hyaline..... 38
38. Thoracic dorsum minutely sculptured..... 39  
Thoracic dorsum with large discoidal punctures..... 68
39. Thorax crimson; abdomen brownish-crimson in some lights; legs light, shining brown.....No. 42 *cruentatum* Huber.  
Not as above..... 40
40. First joint of funicle not more than one-half as long as the second..... 41  
First funicle joint as long as the second..... 42
41. Ovipositor no longer than abdomen; first joint of funicle one-half as long as the second.....No. 43 *multicolor* Huber.  
Ovipositor longer than body; first joint of funicle less than one-half as long as the second; parapsidal furrows hardly apparent.  
No. 44 *koebeleri* Huber.
42. Body deep blue with a crimson tint in some lights; parapsidal furrows not well defined; scutellar apex highly polished.....No. 45 *lividum* Ashmead  
Body entirely brown except a slight tinge of green; about 2.5 mm ..... 43  
Body green or some combination of colors..... 45
43. Body elongate; legs uniform, shining, light brown, except that the femora are slightly tinged with purple and the hind coxae highly crimson.  
No. 46 *dyrophantae* (Ashmead).  
Legs not as above, femora much darker than the tibiae..... 44
44. Thorax very robust; ovipositor shorter than the body.  
No. 47 *anthomyiae* (Ashmead)\*  
Thorax elongate; ovipositor as long as the body.....No. 48 *aeneum* Ashmead.
45. Scape green or greenish-brown..... 46  
Scape generally yellow or testaceous..... 49
46. Ovipositor no longer than abdomen..... 47  
Ovipositor as long as or longer than the body..... 67
47. Thorax strongly robust, dark blue and minutely punctate.  
No. 49 *dasyneurae* Huber.  
Thorax elongate, metallic or bluish green..... 48
48. Thoracic dorsum with transverse, elongate reticulations.  
No. 50 *thalassinum* (Crosby).  
Thoracic dorsum reticulately-punctate and bluish.....No. 51 *rohweri* Huber.
49. Face below the antennae deeply and conspicuously punctured; first joint of funicle two-thirds as long as the second.....No. 52 *punctifrons* (Ashmead).  
Face and antennae not as above..... 50
50. Joints of funicle all distinctly longer than wide, the first joint about as long or longer than the second..... 51  
Joints of funicle not all longer than wide..... 61
51. Body small, not more than 3 mm.; ovipositor generally much longer than body; thorax minutely punctate.....No. 53 *tubicola* Osten Sacken.  
Body normally large, seldom smaller than 3.5 mm. and often as much as 5 mm.; joints of funicle of nearly equal width..... 52
52. Ovipositor distinctly longer than the body which is 4-5 mm..... 53  
Ovipositor not as long as the body..... 58
53. Margins of parapsidal grooves coarsely sculptured; scutellar apex more finely sculptured than rest of scutellum.....No. 54 *mexicanum* (Ashmead).  
Parapsidal grooves not so bordered and the scutellar apex not as above. 54
54. Body entirely indigo blue; dorsum transversely rugose; femora, tibiae, and scape dark testaceous.....No. 55 *coeruleum* Ashmead.  
Body not as above; green or blue..... 55

55. Femora brown, tibiae testaceous; thorax bluish-green.  
 No. 56 *castanopsidis* Huber  
 Femora green..... 56
56. Thoracic dorsum minutely punctate, slightly reticulated but with no irregularly placed impressions; 5 mm.....No. 57 *giganticum* Huber.  
 Thoracic dorsum more conspicuously reticulately punctate, and with large shallow irregularly placed impressions; slightly convex..... 57
57. Scutellar apex punctate; scutellar furrow deep; posterior margin of scutellum golden or brassy.....No. 58 *melanocerae* Ashmead.  
 Scutellar apex not punctate; dorsum with numerous and very deep impressions, the area between them decidedly reticulately-rugose.  
 No. 59 *coccineum* Huber.
58. Thoracic dorsum distinctly blue and finely punctate; scape and tibiae lemon-yellow; ovipositor as long as head and thorax combined.  
 No. 60 *gahani* Huber.  
 Thoracic dorsum brownish or greenish; tibiae testaceous..... 59
59. Ovipositor nearly as long as the body.....No. 61 *brodiei* (Ashmead).  
 Ovipositor a little longer than the abdomen; thoracic dorsum decidedly bronzed; propodeum coarsely sculptured..... 60
60. Femora dark green.....No. 62 *aereum* Huber.  
 Femora blackish brown.....No. 63 *robustum* Huber.
61. Thorax distinctly blue-green, the abdomen dark bronze-brown; scutellar furrow moderately deep, the scutellum about as wide as long; abdomen longer than the thorax.....No. 64 *bicoloratum* Huber.  
 Thorax blackish-green, conspicuously robust and clothed with numerous whitish, appressed hairs, the head and abdomen also similarly clothed; femora greenish-brown to dark brown..... 62  
 Thorax not blackish-green or clothed with white, appressed hairs..... 64
62. Ovipositor distinctly longer than the body; femora dark greenish-brown, the tibiae dark brown except the tips; scutellar furrow scarcely visible.  
 No. 65 *hirsutum* Huber.  
 Ovipositor not more than one and one-half times as long as the abdomen..... 63
63. Scutellar furrow moderately defined; hind femora light greenish-brown, tibiae testaceous; vertex of head normal.....No. 66 *capillaceum* Huber.  
 Scutellar furrow scarcely defined; tibiae infusate; vertex of head unusually thin; ovipositor scarcely longer than abdomen.....No. 67 *hainesi* (Ashmead).
64. Femora and tibiae yellow; ovipositor a little over one-half as long as body.  
 No. 68 *tarsale* Huber.  
 Femora not yellow..... 65
65. Tibiae yellow.....No. 69 *montserrati* (Crawford).  
 Hind tibiae infusate; scutellar furrow well defined.....No. 70 *sativae* Huber.  
 Hind tibiae brownish-black, the others a little lighter in color; scutellar furrow hardly visible..... 66
66. Thorax with a very decided brassy tinge; scape uniform in color.  
 No. 71 *rubenidis* Huber.  
 Thorax not tinged as above or very feebly so; scape brownish-green at the tip.....No. 72 *minutissimum* Huber.
67. Body entirely steel-blue: ovipositor longer than the body; parapsidal furrows deep and well defined.....No. 73 *occidentale* Huber.  
 Body distinctly green; ovipositor as long as thorax and abdomen combined; parapsidal furrows very poorly defined.....No. 74 *albitarse* Huber.
68. Body large, normally not less than 3.5 mm..... 69  
 Body small, normally about 2.5 mm..... 75

69. Body about 5 mm.; crimson-purple; scutellar apex finely punctuate.  
No. 75 *warreni* (Cockerell).  
Body not purplish..... 70
70. Body indigo-blue; ovipositor at least one and one-half times as long as the body which is about 5 mm..... 71  
Body green or greenish-golden; never as above..... 72
71. Propodeum rather coarsely sculptured, with large deep pits on the anterior margin and with a carina; scutellar apex with a more or less striate sculpture..... No. 76 *racemarsae* Ashmead  
Propodeum not coarsely sculptured; no carina; scutellar apex minutely sculptured..... No. 77 *cinerosum* Huber.
72. Ovipositor as long as the body..... 73  
Ovipositor much longer than the body..... 74
73. Body 3.5 mm.; hair vein originating at stigmal vein and extending back and upward toward the tip, and consisting of a single row of hairs; femora and tibiae testaceous..... No. 78 *californicum*, variety *subdolum* Huber.  
Body 4.5 mm.; femora blackish, posterior tibiae blackish, except at tips; abdomen coppery..... No. 79 *maculipenne* (Cameron).<sup>7</sup>
74. Scutellar apex occupying one-third of scutellum; pedicel and ring-joint combined two-thirds as long as first funicle joint; hind femora distinctly bulged on lower margin beyond the middle and minutely roughened.  
No. 80 *californicum* (Ashmead).  
Scutellar apex occupying one-fourth of total area of scutellum; hind femora with lower margin smooth and not bulged.  
No. 81 *elegantissimum* Ashmead.
75. Thorax with some shade of purplish-crimson..... 76  
Thorax never with a crimson tint..... 78
76. Ovipositor one-third as long as the abdomen..... No. 82 *prunicola* Huber.  
Ovipositor longer than the abdomen..... 77
77. Propodeum with a carina..... No. 83 *holcaspoidea* (Ashmead).  
Propodeum not carinate; space between the large discoidal punctures finely reticulate..... No. 84 *solidaginis* Huber.
78. Abdomen mostly yellow; tibiae yellow..... No. 85 *osborni* Huber.  
Abdomen with no yellow color..... 79
79. Thoracic dorsum golden-green..... 80  
Thoracic dorsum never as above..... 81
80. Joints of funicle all wider than long..... No. 86 *umbilicatum* (Gahan).  
Joints of funicle not all wider than long.  
No. 87 *rugosipunctatum* (Ashmead).
81. Scutellar apex golden-green, the rest of thorax bluish-green; all tibiae testaceous..... No. 88 *tricolor* Huber.  
Scutellar apex not as above and tibiae not all testaceous..... 82
82. Tibiae entirely black..... No. 89 *aztecum* (Cameron).<sup>7</sup>  
Tibiae not as above..... 83
83. Scutellum not finely reticulated between punctures; apex of scutellum finely striate; hind tibiae generally infusate, the others testaceous.  
No. 90 *advenum* Osten Sacken.  
Scutellum finely reticulated between large punctures; hind tibiae infusate only at extreme tip..... No. 91 *smithi* (Ashmead).

<sup>7</sup> Placed from description.

84.	Stigmal vein petioled.....	85
	Stigmal vein generally sessile, sometimes subsessile.....	110
85.	Furrow on scutellum readily conspicuous.....	85a
	Furrow on scutellum not easily seen.....	92
85a.	Fore wings with a faintly marked brown area adjacent to stigmal knob.	
	Fore wings not as above.....	86
86.	Propodeum smooth and finely reticulate.....	87
	Propodeum very coarsely rugose and blue.....	91
87.	Body bronzy brown; last joint of funicle about twice as wide as the first.	
	Body never brown as above.....	88
88.	Scutellar apex highly shining and polished.....	89
	Scutellar apex not highly polished.....	90
89.	Coxae and hind femora, except the tips, dark green; rest of legs testaceous; length about 3 mm.....	No. 3 druparum (Boheman).
	Coxae green, the hind femora and hind tibiae infusate and the rest of legs honey-yellow; body bluish.....	No. 8 mellipes Huber.
90.	Fore femora greatly enlarged, about as wide but not as long as the hind femora; scape yellow ferruginous; propodeum with a longitudinal depression beyond a poorly developed carina; length about 2.25 mm.	
	Fore femora normal; scape dark-green; propodeum with a depression as above; length as above.....	No. 2 persimilis (Ashmead).
91.	Scape, fore coxae, and rest of legs yellow ferruginous, the tips of scape brownish; fore coxae sometimes with a greenish tinge at base; about 2.75 mm. long.....	No. 6 amelanchieris (Cushman).
	Scape brownish; fore coxae yellow with a greenish brown tinge, the legs dark testaceous; length about 2.75 mm.....	No. 17 sackeni Ashmead.
92.	Body with a very dense and very conspicuous whitish pubescence, the hairs a little longer on the pronotum and the posterior of abdomen; scape bright green, the femora and tibiae honey yellow; length about 2 mm.	
	Body never clothed as above.....	No. 12 hircinum (Ashmead).
93.	Head round and out of all proportion to size of thorax which is very narrow and elongate; length 1.5 mm.....	No. 19 capite Huber.
	Head transverse and never as above.....	94
94.	Abdomen with a yellow band.....	95
	Abdomen without a yellow band.....	96
95.	Scape and pedicel yellow-ferruginous, the hind tibiae dark testaceous in the middle; sides of pronotum testaceous; length about 2.25 mm.	
	Scape brownish at tip; pronotum entirely green; joints of funicle all longer than wide; length about 3 mm.....	No. 15 duplicatum Huber.
96.	Joints of funicle all longer than wide; scape greenish-brown; legs yellow ferruginous, except the coxae which are greenish and the hind femora which is greenish-brown on the outside and the hind tibiae which are dark testaceous; length about 2 mm.....	No. 13 flavicoxum Osten Sacken.
	Joints of funicle not all long as wide.....	No. 37 baccharidis Huber.
97.	Scape distinctly yellow beneath and infusate above.....	97
	Scape entirely dark.....	100



98. Antennae with all joints of funicle wider than long; the stigmal vein unusually long----- No. 38 *longistigmum* Huber.  
Joints of funicle not as above, some joints longer than wide----- 99
99. Head and anterior of pronotum decidedly purplish; distance from margin of eye to post-ocellus three-fifths as long as from foraminal margin to post-ocellus; about 3.75 mm. in length----- No. 25 *magnificum* Osten Sacken.  
Head and pronotum not purple; femora and tibiae honey-yellow at tips; distance from eye margin to post-ocellus about equal to the distance from the foraminal margin to post-ocellus; length about 3 mm.  
No. 26 *chrysochlora* Osten Sacken.
100. Fore coxae yellow, or nearly so, and others green----- 101  
All coxae green or brownish-green----- 103
101. First funicle joint nearly one-fourth shorter than the second, and the succeeding four joints not much longer than wide; pedicel as long as first funicle and ring-joint combined; legs testaceous, except the coxae which are dark, and the hind femora and hind tibiae which are brownish in the middle; length about 2 mm----- No. 33 *asteridis* Huber.  
Funicle not as above, the first joint as long as the second----- 102
102. First joint of funicle longer than pedicel and ring-joint combined, most of funicle joints one and one-half time as long as wide; are below the tegulae and posterior mesepimeron brassy----- No. 7 *rudbeckiae* (Ashmead).  
First joint of funicle shorter than pedicel and ring-joint combined; about 2mm. in length----- No. 32 *missouriensis* Huber.
103. Hind femora and hind tibiae infusate, the rest of femora and tibiae yellowish; all joints of funicle wider than long----- No. 21 *rhoditidis* Huber.  
All femora infusate or shining green----- 104
104. Tibiae entirely yellow----- 105  
Some or all of tibiae infusate----- 106
105. All femora dark shining green----- No. 30 *japonicum* (Ashmead).  
All femora light brown in middle----- No. 27 *tubularis* Huber.
106. Hind tibiae infusate, the other tibiae testaceous; hind femora bluish on the outside, the other two more bluish-brown; first four funicle joints distinctly longer than wide; length 1.5 mm----- No. 39 *citripes* Huber.  
All or at least two pairs of tibiae infusate----- 107
107. Head seen from front strongly triangular; none of joints of funicle longer than wide; scape dark green; length about 2.25 mm.  
No. 35 *kinseyi* Huber.  
Head not triangular as above----- 198
108. Pedicel as long as funicle and ring-joint combined; ocellocular line one and one-half times the long diameter of post ocellus; ocelli greyish.  
No. 36 *pilularidis* Huber.  
Pedicel not as long as ring-joint and funicle combined----- 109
109. First joint of funicle distinctly longer than wide.  
No. 40 *coloradensis* Huber.  
First joint of funicle distinctly wider than long and about two-thirds as long as the second joint; length about 2 mm.  
No. 20 *ferrugineipes* Huber.
110. Thoracic dorsum with deep punctures----- 111  
Thoracic dorsum minutely punctate or reticulate----- 120
111. Body normally large, about 3 mm----- 112  
Body small----- 116

112. Body entirely crimson-purple; femora green, tibiae purple with a greenish blue tinge.....No. 75 *warreni* (Cockerell).  
Body never as above..... 113
113. Propodeum coarsely sculptured and with carinae; thorax blue, the femora green; first joint of funicle about four times as long as the pedicel and ring-joint combined.....No. 76 *racemareae* Ashmead.  
Propydeum feebly rugose, not carinate; first joint of funicle never more than twice as long as pedicel and ring-joint combined..... 114
114. Flagellum dense black; joints of funicle of equal length; first joint of funicle a little more than twice as long as the pedicel and ring-joint combined; mesoscutum with a decided cupreous tinge.  
No. 81 *elegantissimum* Ashmead.  
Flagellum brown; first funicle joint never twice as long as the pedicel and ring-joint combined; joints of funicle not of equal length..... 115
115. Vein from the stigmal knob toward the tip and upper margin of wing consisting of a single row of hairs; hind tibiae brown, tinged green, the others infusate.....No. 78 *californicum*, variety *subdolum* Huber.  
Vein as above consisting of a double row of hairs; hind tibiae dark testaceous, slightly brownish at tip; other tibiae testaceous.  
No. 80 *californicum* (Ashmead).  
116. Scape yellow; joints of funicle all longer than wide and of equal width.  
No. 85 *osborni* Huber.  
Scape dark, brown with purple tinge and slightly ferruginous at base; joints of funicle wider than long.....No. 84 *solidaginis* Huber.
117. Thoracic dorsum golden-green; hind tibiae infusate, the others and the scape testaceous.....No. 87 *rugospunctatum* (Ashmead).  
Thoracic dorsum never golden-green..... 118
118. Hind femora dark, shining blue-green, the other femora and hind tibiae deeply infusate, the mid and fore tibiae and the scape brownish-yellow; abdomen normally with a violaceous tinge.....No. 88 *tricolor* Huber.  
Hind femora not as above; abdomen greenish or bluish..... 119
119. Body greenish; femora and tibiae blackish-brown; scape with a greenish-brown lustre.....No. 86 *umbilicatum* (Gahan).  
Thorax blue with a strong undershade of brown; femora and tibiae light brown.....No. 90 *advenum* Osten Sacken.
120. Head and thorax strongly crimson with an undershade of brown; abdomen about same; scape light brown; length about 2 mm.  
No. 42 *cruentatum* Huber.  
Entire body dark brown except the tarsi which are whitish; length, 1.5 mm.  
No. 48 *aeneum* Ashmead.  
Body never brown or crimson as above..... 121
121. Joints of funicle all distinctly longer than wide..... 122  
Joints of funicle not all distinctly longer than wide..... 130
122. Body dark indigo-blue or purplish with slight tinge of green in some lights; scape testaceous; tibiae testaceous.....No. 55 *coeruleum* Ashmead.  
Body not indigo-blue or purplish..... 123
123. Margins of parapsidal furrows with large irregularly elongate indentations; thorax green with a bronzy tinge dorsally; scape ferruginous, the tibiae slightly infusate.....No. 54 *mexicanum* (Ashmead).  
Parapsidal furrows not margined as above..... 124

124. Scape dark brown, brownish-green or green----- 125  
 Scape yellow-ferruginous----- 128
125. Tibiae greenish-brown-----No. 57 *giganticum* Huber.  
 Tibiae yellow-ferruginous----- 126
126. Thoracic dorsum bronzyish-green; veins of wings yellow; stigmal vein sub-  
 sessile-----No. 61 *brodiei* (Ashmead).  
 Thoracic dorsum dark bluish or bluish green----- 127
127. Eyes dark brown the ocelli maroon; thorax mostly green; the ocellocular  
 line slightly longer than the layteral ocellar line and about as long as the  
 diameter of mid-ocellus-----No. 56 *castanopsidis* Huber.  
 Eyes pinkish and ocelli transparent; thorax blue; ocellocular line one and  
 one-fifth times the diameter of mid-ocellus; post ocellar line distinctly  
 shorter than the diameter of mid-ocellus----- No. 60 *gahani* Huber.
128. Body large normally 4 mm. or more; femora dark greenish-brown, tibiae  
 dark testaceous and infuscate-----No. 58 *melanocerae* Ashmead.  
 Body small not more than 2 mm----- 129
129. Thoracic dorsum clothed with white appressed hairs. No. 65 *hirsutum* Huber.  
 Thoracic dorsum not clothed as above; all joints of funicle longer than  
 wide but the last one very slightly so----No. 53 *tubicola* Osten Sacken.
130. Thorax blackish and clothed with white appressed hairs; scutellar furrow  
 scarcely defined -----No. 67 *hainesi* (Ashmead).  
 Thorax not conspicuously clothed with white appressed hairs----- 131
131. Scape ferruginous or nearly so ----- 132  
 Scape dark greenish-brown or other dark shade ----- 134
132. Thoracic dorsum reticulated, shining green; legs brown, the femora dark;  
 last two joints of funicle not as long as wide----No. 68 *tarsale* Huber.  
 Thoracic dorsum reticulately punctate or punctate ----- 133
133. Scutellar furrow distinct; femora and hind tibiae blackish-brown, the other  
 femora infuscate; thorax bluish-----No. 64 *bicoloratum* Huber.  
 Scutellar furrow scarcely seen; legs a light and uniform brown; thorax green-  
 ish and very robust-----No. 69 *montserrati* (Crawford)
134. Body purplish-blue; scape testaceous with a slight bluish tinge.  
 No. 49 *dasyneurae* Huber.  
 Body not purplish-blue----- 135
135. Some of joints of funicle, the first at least, longer than wide.  
 No. 71 *rubenidis* Huber.  
 Joints of funicle all wider than long; scape green----- 136
136. Parapsidal furrows scarcely perceptible----- 137  
 Parapsidal furrows deep----- 138
137. Scutellar apex highly polished ----- No. 92 *neuroterum* (Ashmead).  
 Scutellar apex not polished-----No. 44 *koebeleri* Huber.
138. Thorax moderately robust, the dorsum reticulately punctate; and clothed  
 rather densely with whitish hairs; scutellar furrow scarcely apparent.  
 No. 70 *sativae* Huber.  
 Thorax decidedly elongate and reticulate and more or less shining; scutel-  
 lar furrow deep ----- 139
139. Lateral ocellar line one and one-third times as long as the ocellocular; coxae  
 and femora shining green, hind tibiae greenish-brown, the others infus-  
 cate; ocelli maroon-----No. 50 *thalassinum* (Crosby).  
 Lateral ocellar line about equal to the ocellocular line; legs brownish; ocelli  
 and eyes brownish-----No. 51 *rohweri* Huber.

## DESCRIPTION OF SPECIES

## 1. CALLIMOME BRUESI, new name

*Torymus sackeni* BRUES, Bull. Mus. Comp. Zool., vol. 54, 1910, No. 1, p. 17, not *Callimome sackeni* Ashmead.

*Type locality*.—Florissant, Colorado (No. 12869, S. H. Scudder, Coll.).

*Type*.—No. 2068, Museum of Comparative Zoölogy.

This species is the only known fossil representative of the genus *Callimome* Spinola. Brues has placed it here primarily because of its close resemblance to *Callimome magnificum* Osten Sacken.

## 1a. CALLIMOME FULLAWAYI, new name

*Syntomaspis coerulea* FULLAWAY, Journ. New York Ent. Soc., vol. 20, 1912, p. 274, preoccupied by *Callimome coerulea* Ashmead.

*Type locality*.—California.

*Host*.—*Callirhytis agrifoliae* (Bassett).

*Type*.—Collection of Leland Stanford Junior University (lot 499, S. 3).

The type material of this species has not been available for study. I have, however, examined six specimens reared from the same host as the type and determined as this species by A. B. Gahan. These specimens are recorded under Bureau of Entomology number Hopkins U. S. 15922<sup>1</sup> collected at Los Gatos, Calif., on *Quercus chrysolepis* by R. D. Hartman and Hopkins U. S. 12561<sup>2</sup> collected at Ashmead, Oreg., on *Quercus californicus* by J. M. Miller. I find that these specimens agree well with the description referred to above. I am not satisfied that this species is a true *Callimome* due to the fact that the hind femur is somewhat serrate and has a distinct tooth. On the other hand, it shows many characteristics of a *Callimome*. For the present it has been retained in the group where it was originally placed.

## 2. CALLIMOME PERSIMILIS (Ashmead)

## Figure 66

*Torymus persimilis* ASHMEAD, Trans. Amer. Ent. Soc., vol. 21, 1894, p. 334.

*Female*.—Length 3 mm.; ovipositor 2 mm. Thorax green; the front femora greatly enlarged. Head rather robust and wider than long; viewed from the front more or less oval and greenish with a prominent shade of brown which in some lights gives a brassy tinge; face minutely sculptured, clothed with feeble whitish hairs and with a strongly developed carina, which is entirely green; scape honey yellow on the underside and brownish on the upper side; flagellum light brown; the pedicel and first joint of funicle equal; ring-joint one and one-half times as long as wide; joints of funicle gradually growing shorter and somewhat wider toward the tip; antennal depression very shallow, the median ocellus within its apex. Thoracic dorsum

with a strong under shade of brown; pronotum, just behind the juncture with the head, with a transversely rugose area that is smoother than the posterior part; remainder of dorsum minutely reticulately rugose with numerous shallow impressions which are most numerous on the scutellum just on each side of the middle; scutellum with a well-defined cross furrow, the area behind the furrow not so deeply sculptured as before it; propodeum rather widely but not deeply punctured and with a longitudinal impression beginning at the center of the anterior margin and extending back about three-fourths the length of the propodeum; fore coxae entirely yellow; mid coxae yellow, except for a green spot near the base; the hind coxae yellow at the tips only, brown underneath and greenish-brown above; rest of legs entirely yellow, the tarsi light yellow; front femora much swollen, almost as wide as the hind femora; wings with stigmal vein petioled. Abdomen very slender; antero-dorsally light, yellowish-brown, the rest brown with a tinge of green and a cupreous reflection in some lights.

*Male*.—Length 2.25 mm. Darker than the female. Scape yellow ferruginous; flagellum brown ferruginous. Otherwise similar to female.

*Type locality*.—Morgantown, W. Va.

*Host*.—Cecidomyid gall on willow.

*Type*.—Cat. No. 25356, U.S.N.M.

The female is redescribed from one type specimen collected by A. D. Hopkins May 1, 1891. The male is described for the first time from a series of 10 males and 6 females deposited in the National collection and bearing the number 166OL; a single label indicates that they were reared from a Cecidomyid gall on willow. No data under the above number are obtainable.

### 3. *CALLIMOME DRUPARUM* (Boheman)

Figure 43.

*Torymus druparum* BOHEMAN, Svensk. Vet. Akad. Handl., vol. 54, 1833, p. 361, No. 24.

*Syntomaspis druparum* (Boheman) MOKRZECKI, Zeitschr. wiss. Insektb., vol. 2, 1906 p. 309–92.—CROSBY, Bull. 265, Cornell Agr. Exp. Sta., 1909, p. 369.—CUSHMAN, Journ. Agr. Res., vol. 7, 1916, p. 487.—GAHAN, Proc. Ent. Soc. Wash., vol. 24, No. 2, Feb., 1922.

*Type locality*.—Europe, Suecia.

*Host*.—"Seeds of apple (*Pyrus*) and of Mountain ash (*Sorbus*) in Europe and North America." Gahan, 1922. Also *Malus* and *Crataegus*, Wellhouse, W. H. Insect Fauna of the Genus *Crataegus*, Cornell University Agricultural Experiment Station Memorandum 56, June, 1922, page 1131.

*Distribution*.—Many specimens in the National collection reared by R. A. Cushman from apple seeds collected at Orwell, Vt., and

recorded under Quaintance No. 10901. Also 20 specimens F. H. B. 587 quarantine, New York, from seeds of *Pyrus malus* (Hill) Gray, Vienna, Austria, collected by D. G. Tower. Two of the first-named specimens are in the author's collection.

#### 4. CALLIMOME SCALARIS, new species

Figure 98

*Female*.—Length 2.3 mm.; ovipositor 1.5 mm. Body bronze. Head decidedly wider than the thorax and not strongly transverse; viewed from the front clothed with white appressed hairs that are longest below the antennae; carina, below the antennae, extending hardly half the distance to the margin of the mouth; scape fuscous and inserted just a little below the middle of the head; the flagellum rather dark brown; pedicel longer than the first funicle and ring-joint combined and one-third wider than the funicle joint; ring-joint longer than wide; joints of funicle gradually increasing in width toward the tip, the last funicle joint twice as wide as the first, and subequal in width to first joint of club; funicle clothed with short, bristly hairs; ocelli ferruginous; the ocellocular line a little longer than the lateral ocellar line. Thoracic dorsum reticulately punctate, the reticulated areas appearing scalelike and shining; clothed with long, silky white hairs; parapsidal furrows moderately deep; scutellar cross furrows almost imperceptible; scutellar apex not so deeply sculptured as rest of scutellum and hence somewhat shining; propodeum finely reticulated; coxae same color as body, except the tips are lighter; femora and tibiae uniform light shining brown, the tibiae yellowish-brown inside and at tips, the last joint of tarsi brownish; wings strongly ciliate, veins yellowish-brown, marginal vein two-thirds as long as submarginal, and the stigmal vein petioled. Abdomen longer than the thorax, but not as long as the head and thorax combined; rather strongly depressed dorsally; the antero-dorsal area ferruginous; tergites medially emarginate; ovipositor a little longer than the abdomen.

*Male*.—Length 1.75 mm. Head greenish-brown with a cupreous tinge on the face; the pedicel not as long as the first funicle joint and ring-joint combined. Thorax dark green with a brownish tinge; coxae, femora, and tibiae dark brown. Abdomen longer than the thorax. Otherwise similar to the female.

*Type locality*.—Arizona.

*Host*.—*Pachypsylla gemma* Riley on *Celtis*, species.

*Type*.—Cat. No. 25352, U.S.N.M.

Described from seven females and three males. The type female, male allotype, and six paratypes are in the National collection.

*Distribution*.—Three females and one male under Bureau of Entomology No. 371° reared March 5, 1888, from material collected in Arizona by P. T. Baron. Six specimens reared February 14, 1888,

from material collected in Alameda County, Calif., and recorded under the same lot number as above. Two of the latter are in the author's collection.

5. *CALLIMOME SULCATUM*, new species

Figure 94

*Female*.—Length 2 mm.; ovipositor 1.8 mm. Dark shining green, robust, the scutellum with a deep cross furrow. Head transverse and as wide as the thorax; viewed from the front, green with a golden tinge below the antennae; face reticulately-rugose and with a rather prominent carina; scape mostly brown, but yellow ferruginous beneath; flagellum brown; pedicel as long as the first joint of funicle; funicle joints, except the first two, as wide or wider than long; ring-joint wider than long; ocellular line about one and one-half times the diameter of the ocellus. Thoracic dorsum wide, short and strongly arched; furrows well defined; transversely rugose with a few shallow irregularly placed impressions; reticulate punctures on the scutellum more shallow than on the mesoscutum; the scutellar cross furrow very deep and the apex of the scutellum shining; mesepimeron brown, except the posterior part, which is dark green; propodeum smooth, feebly reticulated; coxae greenish-brown; femora greenish-brown in the middle, the hind ones very dark; fore and mid tibiae ferruginous, the hind ones infusate, except the tips; tarsi yellow ferruginous; wings strongly ciliate, veins pale brown, marginal vein four-sevenths as long as submarginal. Abdomen brownish-green and about as long as the thorax; ovipositor more than twice as long as abdomen.

*Male*.—Unknown.

*Type locality*.—Donner, Calif.

*Host*.—Cynipid gall on *Quercus pumila* Walter.\*

*Type*.—Cat. No. 25349, U.S.N.M.

Described from two females reared January 21 to February 1, 1886, and recorded under Bureau of Entomology No. 3770; collected by A. Koebele. The types are deposited in the National collection.

6. *CALLIMOME AMELANCHIERIS* (Cushman)

Figure 52

*Syntomaspis amelanchieris* CUSHMAN, Proc. Ent. Soc. Washington, vol. 19, 1918, pp. 82-83.

*Type locality*.—North East, Pa.

*Host*.—Seeds of *Amelanchier canadensis* (Linnaeus) Medicus.

*Type*.—Cat. No. 20968, U.S.N.M.

*Distribution*.—Besides the type locality mentioned above this species has been reared from the above-named seeds collected by C. R. Cutright at Pickens, W. Va. Mr. Cushman reports that this species is doubtfully phytophagous, or at least it is sometimes parasitic on a species of *Megastigmus*.

\* The species of oak mentioned above is not known to occur in California.

## 7. CALLIMOME RUDBECKIAE (Ashmead)

## Figure 97

*Torymus rudbeckiae* ASHMEAD, Bull. Colorado Biol. Assoc., vol. 1, 1890, p. 26.

The original description follows:

*Female*.—Length 2.3–3.6 mm; ovipositor about 2 mm. Blue, closely, finely punctate, the mesonotum a little rugulose, lower part of face green. Antennae black, scape beneath pale yellow. Parapsides distinct, but not sharply defined, the lateral lobes are not very convex, the middle lobe being about two and one-half times as long as wide. At base of insertion of anterior wings and on the metapleurae are bright, polished, cupreous spots. Legs yellow-ferruginous, all tarsi pale, the hind tibiae fuscous. Abdomen about as long as the head and thorax together, subcompressed, blue, with some greenish tinges at apex, the sides of segments with sparse long hairs, and with a microscopical wavy sculpture. Wings hyaline; tegulae and submarginal vein yellowish, other veins brown; the marginal vein is about thrice as long as the postmarginal, the stigmal short with a prominent hook.

*Male*.—In the male the legs are waxy-yellow, the antennal scape very short, flagellum much stouter, longer and cylindrical, dorsum of abdomen concave at base; otherwise as in female.

The stigmal vein of the wing in this species is petioled; the scutellar cross furrow is not readily conspicuous; in the female the mid and hind coxae are green, the tarsi whitish, except the last two joints, which are brown; the scape of the male is dark, brownish-green, and the flagellum brown in both sexes.

*Type locality*.—West Cliff, Colo.

*Host*.—Gall on *Rudbeckia*, species.

*Type*.—Cat. No. 25353 U.S.N.M.

This species was taken by T. D. A. Cockerell. It was described from one male allotype and one female type. Besides the type series there is a female and a male from the type locality in the National collection.

## 8. CALLIMOME MELLIPES, new species

## Figure 65

Very easily separated from all others by the color of the legs and the unique type of thoracic sculpture.

*Female*.—Length 2.6 mm.; ovipositor 1.3 mm. Thorax bluish purple with a tint of green in some lights; abdomen shining, violaceous-purple. Head same color as the thorax; minutely reticulated and with conspicuous widely separated punctures; scape lemon yellow beneath and brown above; the flagellum brown; pedicel as long as the first joint of funicle; all joints of the funicle after the third wider than long and gradually growing wider toward the tip; eyes brownish. Thoracic dorsum with a sculpture that is very definite, the reticulations being more or less regular in form and seemingly flattened; the surface smoother and the reticulations more clearly defined on the



scutellum; all the dorsum with shallow and irregularly placed impressions, except the central one-third of the scutellum; scutellar cross furrow indicated only by the shining scutellar apex which is more finely reticulated; propodeum green with a bluish tint; the anterior margin of the propodeum punctate; veins of wings and tegulae honey yellow; the stigmal vein petioled; fore coxae brownish at the base, otherwise yellow; mid and hind coxae green, the rest of the legs light yellow, except the tips of tarsi which are brown.

*Male*.—Green with a purple reflection; scape dark brown.

*Type locality*.—Jamaica Plain, Mass.

*Host*.—Cecidomyid gall on *Populus*, species.

*Type*.—Cat. No. 25350, U.S.N.M.

Described from one female reared March 30, 1885, and one male reared March 24, 1885, from galls collected by Miss C. H. Clark and recorded under Bureau of Entomology, No. 3622°. Both specimens are deposited in the National collection.

#### 9. *CALLIMOME EBRIUM* Osten Sacken

Figure 60

*Callimome ebria* OSTEN SACKEN, Trans. Amer. Ent. Soc., vol. 3, 1870, p. 58, No. 1.

*Torymus ebrius* (Osten Sacken) DALLA TORRE, Cat. Hymen., vol. 5, 1898, p. 304.

*Type locality*.—Washington, D. C.

*Host*.—*Lasioptera vitis* Osten Sacken on grape.

*Type*.—Cambridge Museum of Comparative Zoology.

This species was described from one male and two females.

*Distribution*.—There are specimens in the National collection labeled as follows: Two specimens under Hopkins No. 12071, reared June 29, 1914, from a Dipterous gall on wild grape collection by William Middleton at Falls Church, Va. One specimen reared June 18, 1881, from *Lasioptera vitis* Osten Sacken and bearing No. 938a. One specimen, Hunter No. 1278, reared May 19, 1906, from a Bud grape gall by W. D. Hunter, San Antonio, Tex. In the author's collection there are two specimens reared from *Lasioptera vitis* Osten Sacken on wild grape collected near Columbus, Ohio.

#### 10. *CALLIMOME DUBIOSUM*, new species

Figure 49

Closely resembles *Callimome ebrium* Osten Sacken from which it is readily separated. There is a possibility that this species may prove to be identical with *Callimome durum* Osten Sacken, the female of which was not described; the rearing of both sexes from the same host will aid in establishing the true status of the species.

*Female*.—Length 2.25 mm.; ovipositor 3 mm. Body yellowish, except the head which is greenish and the abdomen which is brownish. Head transverse and decidedly wider than the thorax; face

moderately reticulately rugose, and the area below the antennae clothed with long white hairs; carina prominent below the antennal groove which is very shallow; scape entirely yellow; pedicel infusate in middle, yellowish at tips, the rest of flagellum brown and densely pubescent; ring-joint more than twice as wide as long; the joints of the funicle all distinctly longer than wide, except the last two which are very little longer than wide, and all gradually increasing in width toward the tip; ocelli reddish. Thoracic dorsum minutely rugose, mostly yellow, but with a faint tinge of green which is most prominent on the pronotum; parapsidal furrows distinct; scutellar apex more finely sculptured than rest of scutellum; propodeum green, except at the margins; mesepimeron with a green spot posteriorly; legs and ventral portion of thorax bright yellow; wings strongly ciliate, veins pale brown; marginal vein not quite five-sevenths as long as submarginal, the stigmal vein petiolate. Abdomen shorter than the thorax and rather robust; a yellow spot near the middle dorsally; ventrally light brown to yellow ferruginous; ovipositor less than one-third as long as the abdomen.

*Male*.—Unknown.

*Type locality*.—Washington, D. C. (?)

*Host*.—Hickory gall on under side of leaf.

*Type*.—Cat. No. 25399, U.S.N.M.

Described from four females recorded under Bureau of Entomology number 252L° and reared May 2, 1824, by O. Luger. The type and two paratypes are deposited in the National collection. One paratype is in the author's collection.

The greenish tinge of the thoracic dorsum is subject to considerable variation; some specimens are more distinctly yellow than others.

#### 11. *CALLIMOME DURUM* Osten Sacken

*Callimome dura* OSTEN SACKEN, Trans. Amer. Ent. Soc., vol. 3, 1870, p. 59, No. 2.

*Type locality*.—Washington, D. C. (?)

*Host*.—*Diplosis caryae* Osten Sacken.

*Type*.—Cambridge Museum of Comparative Zoölogy.

#### 12. *CALLIMOME HIRCINUM* (Ashmead)

Figure 71

*Torymus hircinus* Ashmead, Trans. Amer. Ent. Soc., vol. 21, 1894, p. 333.

*Type locality*.—Morgantown, W. Va.

*Host*.—Twig gall on willow.

*Type*.—Cat. No. 25360, U.S.N.M.

This species is represented in the National collection by one male (selected as allotype) and one female (type), collected by A. D. Hopkins.

The pubescence of *Callimome hircinum* (Ashmead) is so unique and unusual that a redescription is not necessary. Both type specimens are well preserved.

13. *CALLIMOME FLAVICOXUM* Osten Sacken

Figure 46

*Callimome flavicoxa* OSTEN SACKEN, Trans. Amer. Ent. Soc., vol. 3, 1870, p. 61; No. 4.

*Torymus flavicoxa* (Osten Sacken) DALLA TORRE, Cat. Hymen., vol. 5, 1898, p. 305.

*Type locality*.—Presumably Connecticut.

*Host*.—*Rhodites radicum* Osten Sacken.

*Type*.—In the Cambridge Museum of Comparative Zoölogy.

This species was described from several specimens.

*Distribution*.—Connecticut (?). The following are in the National collection: Seven specimens Hopkins No. 11349, reared April 14 to June 3, 1913, from *Diastrophus nebulosus* Osten Sacken at Minor's Hill, Falls Church, Va., collected by William Middleton. Two specimens Hopkins No. 11332, reared June 12, 1913, from *Diastrophus nebulosus* Osten Sacken. Some miscellaneous specimens from New Jersey and Waterbury, Conn. Four specimens reared by E. R. Sasser, April 29, 1906, at Washington, D. C. Two specimens reared by A. C. Kinsey from *Diastrophus nebulosus* Osten Sacken at Forest Hill, Mass., are in the author's collection.

14. *CALLIMOME FULVUM*, new species

Figure 47

Resembles *Callimome flavicoxum* Osten Sacken and *Callimome duplicatum*, new species, in the color markings of the abdomen, but is separated from the former by the length of the ovipositor, and from the latter by its larger size and antennal characters as mentioned in the key.

*Female*.—Length, 4.5 mm.; ovipositor about as long as abdomen. Thorax greenish, the abdomen flavo-testaceous to brownish. Head transverse and very much wider than the thorax, entirely violaceous-crimson and cupreous in some lights; face minutely reticulated but with numerous, irregularly scattered, impressions and clothed sparsely with feeble white hairs; facial carina broad, extending two-thirds the distance to the margin of the mouth; scape yellowish and long, attaining level of median ocellus; pedicel and ring-joint brunneous, the former equal in length to the second joint of funicle, but very distinctly shorter than the first joint of funicle, which is narrowed at the base; ring-joint a little longer than its width at base; last joint of funicle just a little longer than wide, the club longer than the last two funicle joints combined; funicle and club black, each joint with

two rows of short whitish hairs; ocelli amber, eyes pinkish-brown. Pronotum cupreous with a purplish tint just back of juncture with the head, and with a cupreous band on the posterior margin; meso-scutum rather coarsely reticulated, the scutellum more finely so, but both with numerous, round and irregularly scattered impressions which are most apparent on the scutellum; entire dorsum with a slight cupreous reflection; propodeum with large reticulations, but not deep, the grooves transverse in center and longitudinal on the sides; spiracles prominent, the area around them coppery; both the anterior and posterior margin of propodeum with large pits; fore and mid coxae entirely yellow, the hind coxae yellow, except for about one-fifth of the base, which is green shading into brown; rest of legs yellow; wings strongly ciliated, veins pale brown; the marginal vein seven-tenths as long as submarginal, the stigmal vein petioled. Abdomen yellow testaceous, except the posterior one-third, which is brown; strongly compressed, carinate dorsally; tergites emarginate; sheath of ovipositor thicker than the basal joint of hind tarsi.

*Male*.—Unknown.

*Type locality*.—Nebraska.

*Host*.—Unknown.

*Type*.—Cat. No. 25397, U.S.N.M.

Described from one female. This specimen was associated in the National collection with *Callimome flaviventre* (Ashmead).

#### 15. *CALLIMOME DUPLICATUM*, new species

##### Figure 55

Closely allied to *Callimome flavicorum* Osten Sacken, but is separated by characters indicated in the key.

*Female*.—Length 3 mm.; ovipositor 1.2 mm. Thorax green, the abdomen brownish with a rather wide yellow band dorsally. Head transverse, the face reticulately punctate and clothed sparsely with fine hairs; scape long, slender and pale ferruginous, the tips on upper side slightly brown; pedicel ferruginous, the ring-joint darker and about as long as wide; funicle dark brown, each joint clothed with two rows of widely separated and regularly arranged yellowish hairs in addition to a finer type of pubescence; first four funicle joints distinctly longer than wide, the succeeding joints a very little longer to not as long as wide; pedicel very slightly longer than first joint of funicle; vertex more coarsely punctate than the face and with a crimson tinge in some lights; ocelli amber; post ocellar line twice the length of the lateral ocellar line and two-thirds the length of the distance between the post ocelli. Thoracic dorsum moderately rugose; posterior margin of pronotum highly shining and cupreous, the sides yellow-ferruginous; scutellar cross furrow conspicuous at certain angles; anterior of scutellum more finely punctate than the

mesoscutum; scutellar apex not so deeply punctate and hence appearing somewhat polished; propodeum and metanotum steel-blue, the former moderately longitudinally reticulated; legs, except the bases of hind coxae which are green, entirely yellow ferruginous, the tarsi paler; wings strongly ciliate, veins dark yellow; marginal vein three-fourths as long as submarginal, the stigmal vein petioled. Abdomen as long as thorax, five-sixths as wide and much flattened dorsally; antero-dorsally with a brown spot about the width of hind femora, the remaining of abdomen yellow ferruginous, except a dark brown area dorsally that extends from the tip of abdomen to the middle; ovipositor as long as abdomen.

*Male*.—Length 2.5 mm. Funicle joints, except the first two, about as wide or wider than long. Otherwise about same as female.

*Type locality*.—Chagrin Falls, Ohio.

*Host*.—*Diastrophus cuscuteformis* Osten Sacken on *Rubus*, species.

*Type*.—Cat. No. 25362, U.S.N.M.

Described from seven females and three males recorded under Bureau of Entomology No. 6635° and reared May 18, 1895, from material collected in the type locality by A. R. Phillips. Besides the series from the type locality the National collection contains one female from Waterbury, Conn., and also one female recorded under Hopkins No. 13606 reared June 28, 1915, from galls of *Diastrophus cuscuteformis* Osten Sacken on *Rubus*, species collected by Wm. Middleton at Falls Church, Va. A paratype from the type locality in the collection of the author.

#### 18. *CALLIMOME ALAMEDENSIS*, new species

Figure 48

Very closely allied to *Callimome sackeni* Ashmead but is smaller, not so robust, has a longer ovipositor and some different antennal characters as already indicated.

*Female*.—Length 3.5 mm; ovipositor 2 mm. Thorax bluish-green, the abdomen green with a strong cupreous reflection posteriorly. Head as wide as the thorax; viewed from the front green with a slight cupreous tinge and sparsely clothed with short white hairs; carina, below the antennae, very low and wide; scape yellow ferruginous, except the tip above which shows brown; flagellum black, the pedicel and ring-joint brownish-black; pedicel longer than the first funicle joint; the ring-joint as long as wide; first three joints of funicle a little longer than wide, the rest wider than long and all clothed sparsely with white hairs; vertex cupreous and more coarsely sculptured; postocellar line one and one-half times the long diameter of an ocellus. Thoracic dorsum moderately reticulately rugose and with numerous shallow pits; scutellum with a purplish line extending from the anterior margin to a point about two-thirds the distance posteriorly; posterior one-fourth of scutellum with a distinct

cross furrow; the scutellar apex somewhat polished, more conspicuously so than *sackeni*; propodeum deeply sculptured and shagreened through the median one-third, the lateral one-third being sculptured more nearly as the dorsum; fore coxae yellow testaceous but with a distinct greenish tint on the basal one-third; mid coxae green with a bronzy reflection, the hind coxae green at the base and the tip but with a purple hue through the center, the tip testaceous; femora and tibiae dark testaceous; the tarsi testaceous stigmal vein petioled. First segment of abdomen bronzy green; posterior part of abdomen decidedly cupreous; ovipositor about one-fifth longer than the abdomen.

*Male*.—Length 2.75 mm. Scape yellowish beneath and mostly dark green above; joints of funicle about as long as wide and of nearly equal width; fore coxae not so yellow as in female, legs pale testaceous, the tips of joints yellowish. Abdomen shorter than the thorax.

*Type locality*.—Alameda, Calif.

*Host*.—Gall on "currant."

*Type*.—Cat. No. 25358, U.S.N.M.

*Distribution*.—Described from 16 females and 9 males reared May, 1888, from the above-named host and recorded under Bureau of Entomology No. 399°; and from 9 specimens Hopkins No. 11059a<sup>1</sup> reared by B. T. Harvey from galls on *Rubus nutkanus* Mocino, at Necanicum, Oreg., May 2, 1913. Two paratypes from the first named series are in the author's collection.

#### 17. *CALLIMOME SACKENI* Ashmead

##### Figure 164

*Callimome brevicauda* OSTEN SACKEN, Trans. Amer. Ent. Soc., vol. 3, 1870, p. 62, No. 6, not *Callimome brevicauda* Walker.

*Callimome sackeni* ASHMEAD, Trans. Amer. Ent. Soc., vol. 9, 1888, Proc., p. xxxii (new name for *brevicauda* Osten Sacken).

*Callimome brevissimicauda* ASHMEAD Trans. Amer. Ent. Soc., vol. 9, 1888, Proc., p. xxxiii.

*Callimome fagopyrum* PROVANCHER, Nat. Can., vol. 12, 1881, p. 291.

*Callimome virentis* ASHMEAD, Trans. Amer. Ent. Soc., vol. 9, 1881, Proc., p. xxxiv.

*Torymus virentis* (Ashmead) ASHMEAD, Trans. Amer. Ent. Soc., vol. 14, 1887, p. 188.

*Torymus brevicauda* (Osten Sacken) ASHMEAD, Trans. Amer. Ent., vol. 14, 1887, p. 188.

*Torymus brevissimicauda* (Ashmead) DALLA TORRE, Cat. Hymen., vol. 5, 1898, p. 301.

*Torymus ostensackeni* DALLA TORRE, Cat. Hymen., vol. 5, 1898, p. 311 (new name for *brevicauda* Osten Sacken).

*Female*.—Length 3.5 mm.; ovipositor 1.2 mm. Thorax green and robust; abdomen cupreous. Head transverse; viewed from front reticulately rugose, green with a cupreous tinge; carina separating the

antennae and extending three-fourths the distance to margin of clypeus; scape yellow, the flagellum brown; pedicel a little longer than the first funicle joint and the ring-joint a little wider than long; first four joints of funicle slightly longer than wide, the succeeding ones wider than long, and all clothed with brownish hairs; ocellocular line about one and one-fifth times the length of the long diameter of posterior ocellus and also longer than the lateral ocellar line; ocelli pink, the eyes red. Thorax green but with cupreous and purple tints in some lights; scutellar cross-furrow quite conspicuous at certain angles and the sculpture a little coarser behind it; metanotum very coarsely rugose and with a distinct bluish tinge; fore coxae yellow with a green spot at the base, the mid coxae greenish-yellow, the hind coxae green but with a yellow tip; rest of legs yellow-ferruginous; stigmal veins of wings petioled. Abdomen robust, ovate as seen from above and two-thirds as long as thorax; bluish with a purple tint antero-dorsally, the posterior half with a cupreous reflection; ovipositor about as long as abdomen.

The type of this species is *Callimome brevicauda* Osten Sacken. It is redescribed here from two female paratypes recently received in exchange by the United States National Museum from the Museum of Comparative Zoölogy.

*Male*.—Length 2.75 mm. Scape and legs yellow ferruginous; eyes maroon; joints of funicle proportionately wider than in female; mid coxae green.

*Type locality*.—Not certain.

*Host*.—*Diastrophus nebulosus* Osten Sacken.

*Paratype* of *brevicauda* Osten Sacken.—Cat. No. 25389, U.S.N.M.

*Type* of *brevicauda* Osten Sacken.—Museum of Comparative Zoölogy, No. 813.

The male allotype is described from one of several specimens recorded under Hopkins No. 11332 and reared April 22, 1913, from *Diastrophus nebulosus* Osten Sacken, on *Rubus*, species, and collected by William Middleton at Falls Church, Va.

*Distribution*.—The national collection contains the following: Three specimens of *Callimome brevissimicauda* Ashmead. Type, Cat. No. 1359, U.S.N.M. reared from *Diastrophus nebulosus* Osten Sacken, on *Rubus*, species, Jacksonville, Fla. Two females of *Callimome virentis* Ashmead Type; Cat. No. 2838, U.S.N.M., reared from *Andricus virens* on live oak, Jacksonville, Fla. Nine specimens, Hopkins No. 11349, reared April 7 to June 13, 1913, from *Diastrophus nebulosus* Osten Sacken, on *Rubus*, species, Falls Church, Va., William Middleton, collector. Eighteen specimens, Hopkins No. 11332, reared April 13 to June 13, 1913, with data as above. Fourteen specimens recorded under Bureau of Entomology No. 3270, August 5, 1884. Three specimens reared from *Diastrophus turgidus* Bassett, Toronto, Canada.

bearing the name *Torymus sackeni* Ashmead. Twelve specimens collected by C. F. Baker, Agricultural College, Michigan, with Nos. 468, 187, 608, and 356. Three specimens from Waterbury, Conn. One specimen from Plummer Island, Md., and one specimen from Duval, Ga. Four specimens recorded under No. 218 with no further data other than reared January 29, 1891.

Felt<sup>9</sup> records this species as parasitic on an Itonid midge gallmaker, namely, *Dasyneurae serrulatae* Osten Sacken on *Alnus crispa* (Aiton) Pursh, and on *Dasyneurae rosarum* Hardy on *Rosa*, species.

I have not had opportunity to examine the types of *Callimome fagopyrum* Provancher, but have put this species into synonymy from a careful study of the description. In this genus of a little more than 100 species there are but 2 species that have a rugose propodeum together with the supporting characters mentioned by Provancher. One of these, *ribesii* Huber, is reported from California only, while the other, *sackeni* Ashmead has been reported from Canada as already mentioned. It seems likely that *fagopyrum* and *sackeni* are identical.

#### 18. CALLIMOME ALASKENSIS, new species

Figure 59

*Torymus cecidomyiae* (Walker) ASHMEAD, Proc. Washington Acad. Sci., vol. 4, 1902, p. 143, misidentification of *Callimome cecidomyiae* Walker.

*Female*.—Length 2.75 mm; ovipositor 1.5 mm. Body mostly dark green. Head as wide as thorax; viewed from the front subtriangular, sparsely clothed with white hairs and with a slight coppery reflection in some lights; carina separating antennae very well developed and decidedly elevated just below the antennae; scape long, blackish-green, flagellum dark brown; pedicel as long as the first joint of funicle, the ring-joint a little longer than wide; second and succeeding joints of funicle at least one-fourth shorter than the first and gradually increasing in width toward the tip; the first two joints of club a little shorter than the two preceding joints; ocellocular line equal to the lateral ocellar line. Thoracic dorsum with a cupreous tinge in some lights; mesoscutum finely reticulately punctate, the anterior portion rugose; scutellum smoother, not rugose, but with several shallow widely separated pits; scutellar cross furrow apparent on sides of scutellum, but visible only at certain angles in the middle; scutellar apex not so deeply reticulated and with a highly cupreous reflection; metanotum with a carina; propodeum coppery and smooth; coxae dark green, fore and mid femora infuscate in the middle outside, ferruginous at the tips, the hind femora dark brown with a slight greenish tint, except the tips, which are ferruginous; tibiae testaceous; last joint of tarsi brown; veins light brown; marginal

<sup>9</sup> Report State Entomologist, 1913, pp. 166-187.



vein five-eighths as long as submarginal; stigmal vein petioled; abdomen mostly dark green, the first four segments medially incised; ovipositor just a little longer than the abdomen.

*Male*.—Unknown.

*Type locality*.—Kodiak, Alaska.

*Host*.—Unknown.

*Type*.—Cat. No. 25400, U.S.N.M.

In the reference cited above four specimens of *Callimome cecidomyiae* Walker are reported; they are all deposited in the National collection. Upon examination I have found three of them identical, while the fourth specimen belongs to a species of *Callimome* as yet undescribed. Inasmuch as the form represented by the three specimens does not agree with the rather inadequate description of *cecidomyiae*, and since I have not examined Walker's type, I have described it as a new species.

*Distribution*.—All these specimens were taken by T. Kincaid on the Harriman expedition, 1899. The type was taken on July 20; one paratype July 9 on Popoff Island, and another paratype July 26 at Virgin Bay.

19. CALLIMOME CAPITAE, new species

Figure 100

Easily separated from all other species by the unusual shape of the head.

*Female*.—Length 2.5 mm; ovipositor 2 mm. Thorax bluish-green and finely sculptured; the abdomen blue with a purple tint. Head distinctly wider than the thorax and very large, the vertex one-half as wide as the width of the head; head almost as thick as the width of pronotum; scape mostly yellow, brownish on upper side at tips; flagellum brown, the pedicel and ring-joint darker; the pedicel a little longer than the first joint of funicle; ring-joint as long as wide, and the joints of funicle not longer than wide; ocelli very small and forming an unusually high triangle, the posterior margin of mid ocellus separated from a line touching the anterior margins of the posterior ocelli by the length of the diameter of an ocellus; eyes reddish and not prominent. Thorax very elongate and narrow; scutellum oblong, nearly twice as long as wide; propodeum smooth, fore coxae infusate with a greenish tint, the mid coxae darker, and the hind ones greenish-blue with a tint of brown on the upper edge; rest of legs yellow, except the hind femora and hind tibiae which are infusate on the outside, and the tarsi which are yellow. Abdomen as long as thorax, three-fifths as wide and twice as deep as wide; wings strongly ciliate, veins light brown; marginal veins five-sixths as long as submarginal, and the stigmal vein petioled.

*Male*.—Length 1.4 mm. Uniform green and somewhat shining. Scape green, joints of funicle wider than long; coxae greenish brown,

legs yellowish, except all femora which are infusate on the outside, the hind ones entirely brown; hind tibiae infusate, except at tips; tarsi with last joint brown.

*Type locality*.—Washington, D. C.

*Host*.—*Lasioptera*, species.

*Type*.—Cat. No. 25357, U.S.N.M.

Described from three females and five males reared June 24 to July 7, 1884, and recorded under Bureau of Entomology No. 818 Pb°. The female type, a male allotype, and four paratypes are deposited in the National collection. Two paratypes are in the author's collection.

#### 20. CALLIMOME FERRUGINEIPES, new species

##### Figure 61

*Female*.—Length 2.25 mm.; ovipositor 0.6 mm. Body green, legs dark testaceous. Head about as wide as the thorax; viewed from the front minutely sculptured and with a brassy luster in some lights; clothed with short feebly appressed hairs below the antennae; carina, separating antennae, poorly developed; scape uniform, dark testaceous, flagellum dark brown; pedicel distinctly longer than the first joint of funicle, the ring-joint about as long as wide; all joints of funicle wider than long and gradually increasing in width toward the tip; scape, plus the width of pedicel, attaining the level of the median ocellus; ocelli and eyes maroon. Thoracic dorsum green with a brassy reflection in some lights; minutely reticulately rugose with several shallow impressions; mesoscutum and scutellum gently convex; propodeum feebly reticulated, green and shining, the anterior margin with small pits; coxae almost entirely green, the rest of legs uniformly dark testaceous, except that the hind femora show a trace of brown and the tarsi are somewhat lighter; wing strongly ciliate, marginal vein two-thirds as long as submarginal, the stigmal vein petioled. Abdomen rather robust and shorter than the thorax; tergites nearly emarginate medially and steel blue in color; first three segments incised, the second and third feebly so.

*Male*.—Length 2 mm. Darker than the female and without any apparent brassy tint. Scape dark green; two front pairs of femora and tibiae and the hind tibiae with brownish green markings on the outside, the hind femora entirely green with a bluish tint, except the tips; last joint of tarsi brown. Abdomen shorter than the thorax and depressed.

*Type locality*.—Argus Mountains, California.

*Host*.—Collected on *Pinus monophylla* Torrey and Frémont.

*Type*.—Cat. No. 25394, U.S.N.M.

Described from 13 females and 1 male collected in May, 1891, by A. Koebele. The female type, male allotype, and 11 paratypes in the National collection. One paratype is in the author's collection.

In some specimens the hind femora are much darker, the color varying from a testaceous to a dark testaceous.

21. *CALLIMOME RHODITIDIS*, new species

Figure 95

*Female*.—Length 2 mm.; ovipositor about 1 mm. Thorax bluish-green with an undershade of brown. Head much wider than the thorax; seen from the front mostly brown beneath the antennae but with a tinge of green; carina extending two-thirds the distance from the antennae to the mouth; scape brown testaceous, the tips darker; the flagellum brown; pedicel robust and as long as the next two joints combined, the ring-joint as long as wide; joints of funicle as wide or wider than long, except the second and third; vertex with a golden tinge. Thoracic dorsum minutely reticulately punctate and clothed with rather long white hairs; scutellar cross furrow not prominent but easily conspicuous at certain angles; scutellar apex slightly shining; propodeum finely reticulated, smooth and with a delicate greenish-purple color; coxae brown testaceous, rest of legs entirely dark testaceous, except the hind tibiae which are moderately infuscate and the tarsi which are somewhat lighter; wings strongly ciliate, veins pale brown, marginal vein four-fifths as long as submarginal, the stigmal vein petioled. Abdomen about same length as thorax; segments rather emarginate, but the first three with incisions visible at certain angles; antero-dorsally a delicate brown with a lavender or greenish tinge; sides brown and sparsely clothed with hairs; ovipositor as long as abdomen.

*Male*.—Scape dark brown; coxae dark brown; the hind femora and hind tibiae infuscate, the rest of legs yellowish. Abdomen depressed.

*Type locality*.—Jamaica Plain, Massachusetts.

*Host*.—*Rhodites*, species on *Rosa*, species.

*Type*.—Cat. No. 25354, U.S.N.M.

Described from one female and three males reared from a gall May 12 or May 21, 1884, by Miss Cora N. Clarke, and recorded under Bureau of Entomology No. 3239. The female type, male allotype, and one paratype are in the National collection. One male paratype is in the author's collection.

22. *CALLIMOME SYLVICOLA* (Ashmead)

Figure 53

*Torymus sylvicola* ASHMEAD, Mem. Carnegie Mus., vol. 4, No. 1, p. 399.

*Type locality*.—Chapada, Brazil.

*Host*.—Unknown.

*Type*.—Cat. No. 8057, U.S.N.M.

Described from two females taken in April and October, one of which is in the National collection.

23. *CALLIMOME AENEOSCAPUM*, new species

Figure 56

*Female*.—Length, 2.25 mm.; ovipositor, 0.4 mm. Dark green with a very strong bronzy reflection. Head transverse, as wide as the thorax and a little wider than long; scape dark, brownish-green, the flagellum fuscous; pedicel with a greenish tinge and longer than the first joint of funicle; all joints of funicle longer than wide and closed rather sparsely with light brown hairs; antennal depression rather prominent, the median ocellus in its apex above; eyes dark red. Thoracic dorsum minutely reticulated and with numerous shallow impressions; pronotum with a shining green band at the anterior margin, the parapsidal furrows well defined and green; propodeum feebly but distinctly sculptured; coxae green with tints of bronze; fore and mid femora mostly yellow ferruginous, the front ones, which are swollen, infusate on the outside, except at the tips; the mid femora also infusate, the hind femora entirely dark brown but with a tint of green on the outside; hind tibiae infusate, the others yellow, except a little brown streak on the outside; wings strongly ciliate, veins brown; the marginal vein seven-eighths as long as the submarginal and the stigmal vein petioled. Abdomen distinctly shorter than the thorax and robust; ovipositor one-third as long as the abdomen.

*Male*.—Unknown.

*Type locality*.—Nampa, Idaho.

*Host*.—Unknown, but "reared from gall."

*Type*.—Cat. No. 25401, U.S.N.M.

Described from one female recorded under Bureau of Entomology No. 2655° and reared June 7, 1893, from material collected by R. Milliken.

24. *CALLIMOME ROSAE*, new species

Figure 96

*Female*.—Length, 2.5 mm.; ovipositor, 2.75 mm. Thorax dark green. Head transverse and wider than the thorax; face with a cupreous tinge in some lights, minutely reticulated and clothed very sparsely with feeble hairs; carina separating the antennae and extending one-half the distance to the mouth; antennal depression shallow; scape long, somewhat flattened, and reaching above the level of the median ocellus; scape greenish-brown, except the basal one-third which is yellow testaceous on the outside; flagellum brown; pedicel and ring-joint combined longer than the first joint of funicle; the ring-joint as long as wide and all joints of funicle distinctly longer than wide; the ocellocular line about two and one-half times the diameter of an

ocellus; eyes red. Thoracic dorsum with a slight cupreous tinge at certain angles and minutely reticulate rugose; scutellum flattened and the cross furrow very obscure; propodeum minutely reticulated and cupreous; incision in the mesepimeron very shallow; coxae green, yellowish at the tips, trochanters yellow, femora yellow with a brown area in the middle on the outside; the hind femora entirely brown, except the tips; fore tibiae yellow, the hind ones light brown, except the tips; tarsi yellow, the last joint brown; wings strongly ciliate, veins brown; marginal vein four-fifths as long as the submarginal, the stigmal vein petioled. Abdomen longer than the thorax; green dorsally, the ventral and lateral areas bronzy; very slightly subcompressed.

*Male*.—Unknown.

*Type locality*.—Durango, Colo.

*Host*.—*Rhodites*, species on *Rosa fendleri* Crepin.

*Type*.—Cat. No. 25396, U.S.N.M.

Described from two females reared May 18, 1899, from material collected by C. F. Baker and recorded under Bureau of Entomology No. 8513<sup>01</sup>.

#### 25. *CALLIMONE MAGNIFICUM* Osten Sacken

##### Figure 62

*Callimome magnifica* OSTEN SACKEN, Trans. Amer. Ent. Soc., vol. 3, 1870, p. 62, No. 7.

*Callimome magnifica* (Osten Sacken) ASHMEAD, Trans. Amer. Ent. Soc., vol. 14, 1887, p. 188, No. 23 not *Callimome* (*Torymus*) *bedeguaris* Linnaeus.

*Female*.—Length, 4.75 mm.; ovipositor, 6 mm. Head viewed from the front rather triangular; antennae separated by a prominent carina; face with indistinct and irregularly placed impressions and with a cupreous reflection; scape yellow, the flagellum brown; all joints of funicle longer than wide, the first four or five twice as long as wide; vertex purplish; ocellocular line about one and one-fourth times the long diameter of the post ocellus which is distinctly longer than the lateral ocellar line. Pronotum with a purplish spot at juncture with the head; rest of thoracic dorsum with a bluish green color and with numerous equally distributed impressions; pubescence very delicate; propodeum smooth, shining, bluish, and with small punctures on the anterior margin; fore coxae greenish-brown at base, the rest yellowish; mid coxae green testaceous; hind coxae green, yellowish at the tips; rest of legs yellow ferruginous; wings strongly ciliate, the stigmal vein petioled. Abdomen narrow and very decidedly longer than the thorax; somewhat produced anteriorly and cupreous with a tinge of purple; rest of abdomen purple-violaceous with tints of blue in some lights.

*Male*.—Length, 3.75 mm. Abdomen as long as the thorax, the posterior two-thirds cupreous with a purple tint. Otherwise essentially as in female.

*Type locality*.—Probably Connecticut.

*Host*.—*Rhodites radicum* Osten Sacken on *Rosa*, species.

*Paratype*.—Cat. No. 25391, U.S.N.M.

*Type*.—Museum of Comparative Zoölogy, No. 815.

This species is redescribed from the male and female paratypes in the National collection.

There are in the National collection three females and one male of *Callimome bedeguaris* (Linnaeus) reared in Europe and determined by G. Mayr. These are undoubtedly the specimens examined by Ashmead and upon the study of which he based his conclusions that *Callimome bedeguaris* (Linnaeus) and *Callimome magnificum* Osten Sacken were identical.<sup>10</sup> The fact that both species have similar hosts and that they are very much alike in size and shape probably induced him to consider them as identical. However, after a careful study and comparison of the European specimens with specimens of *Callimome magnificum* Osten Sacken, I am convinced that they are not identical. They differ as follows: The propodeum and abdomen are entirely cupreous in *Callimome bedeguaris* (Linnaeus), whereas they are purplish or bluish in *Callimome magnificum* Osten Sacken; in the former the scutellar cross furrow is quite evident and the scutellar apex rather smooth and shining while in the latter the opposite is true; in *bedeguaris* the sculpture of the thorax is coarser, and the width of the mouth proportionately greater and the length of the head proportionately shorter than in *magnificum* which has the head more or less anteriorly produced.

*Distribution*.—Connecticut (?). In addition to the type series the following specimens are in the National collection: Four specimens from Waterbury, Conn. Two specimens reared February 6, 1884, at Nyack, N. Y., by J. L. Zabriskei and recorded under No. 145. Three specimens reared June 22, 1915, from *Rhodites radicum* Osten Sacken, collected by G. O. Donnel, Washington, D. C. One specimen from Waterbury, Conn., is in the author's collection.

#### 26. CALLIMOME CHRYSOCHLORA Osten Sacken

##### Figure 63

*Callimome chrysochlora* OSTEN SACKEN, Trans. Amer. Ent. Soc., vol. 3, 1870, p. 63, No. 8.

*Callimome solitaria* OSTEN SACKEN, Trans. Amer. Ent. Soc., vol. 3, 1870, p. 64, No. 9.

*Female*.—Length 3.75 mm.; ovipositor 2.75 mm. Thorax green with a bluish tinge, and as long as abdomen. Head as wide as thorax; viewed from the front green and reticulately rugose; antennae separated by a carina that extends two-thirds of the distance to the margin of the mouth, the area below the carina decidedly cupreous;

<sup>10</sup> Trans. Amer. Ent. Soc., vol. 3, 1870, p. 62.

scape yellow, brownish at tips on upper side; ocellocular line exactly equal to the long diameter of post ocellus; distance from the foraminal margin to post ocellus one and one-half times the long diameter of post ocellus; pedicel brown and exactly as long as the first joint of funicle which is subequal to the second (flagellum broken off except the first two joints); thoracic dorsum clothed rather densely with silvery white hairs; parapsidal furrows well defined; tegulae yellow; scutellar apex rather highly polished on the posterior half the scutellar cross furrow scarcely visible; metanotum with a carina propodeum smooth, shining, and very feebly longitudinally reticulate; fore coxae greenish brown on the outside and yellow on the inside; mid coxae yellow ferruginous with a green tint; hind coxae green above, brown below and yellow at the tip; rest of legs yellow; wings ciliate; stigmal vein petioled. Abdomen dorsally with first three segments purplish blue, the anterior two-thirds of first with a testaceous undershade; first and second segments deeply incised, the third feebly incised; rest of abdomen greenish brown in some lights; hairs on sides more or less conspicuous.

*Male*.—Length 2.8 mm. Essentially same as female.

*Type locality*.—Probably Connecticut.

*Host*.—*Rhodites dichloceros* (Harris) Osten Sacken.

*Paratype*.—Cat. No. 25390, U.S.N.M.

*Type*.—Museum of Comparative Zoölogy, No. 818."

The female is redescribed from the paratype in the National collection.

*Callimome magnificum* Osten Sacken, *Callimome chrysochlora* Osten Sacken, and *Callimome solitaria* Osten Sacken were recognized by Osten Sacken as a difficult complex. There can be no doubt that the first named species is good; but it seems that there is considerable doubt as to the last two. It is my opinion that specimens formerly included under the last two species mentioned are conspecific and should be called *chrysochlora*.

In the National collection there are about 50 specimens reared from *Rhodites multispinosus* Gillette, taken in Illinois, and a like number reared from *Rhodites variabilis* Bassett, taken in Arizona. From the former lot I have selected four females that agree with the paratype described above; the remaining specimens differ primarily in having a longer ovipositor and a cupreous abdomen. In this series the ovipositor varies in length and the body varies somewhat in color. The specimens from Arizona are essentially alike, differing only in that some have a distinctly greenish-brown femora. I prefer to think of this complex as one in which there is considerable variation and in which some individuals are perhaps mutants. Careful breeding experiments may be necessary in order to establish the truth.

*Distribution.*—Connecticut (type). Fifty-three specimens, Hopkins No. 13604a, reared June 4 to August 6, 1915, by Wm. Middleton from *Rhodites multispinosus* Gillette, collected by L. H. Weld at Fort Sheridan, Ill. Forty-eight specimens, Hopkins No. 75600, reared from *Rhodites variabilis* Bassett April 29 to July 17, 1918, collected by L. H. Weld at Prescott, Ariz. One specimen from *Rhodites multispinosus* Gillette taken at Oxbow, Saskatchewan, by F. Knab. Three specimens from *Lytorhodites arefactus* on *Rose tendleri* Crépin, reared April 19, 1899, from galls collected in New Mexico. The following are in the author's collection: Six specimens reared July 24 to August 3 from *Rhodites dichloceros* (Harris) Osten Sacken on *Rosa*, species at Buckeye Lake, Ohio. The following were taken by A. C. Kinsey (dates given refer to time gall was collected and not to the time when parasites emerged): Two specimens March 17, 1920, at Ujia, Calif., from *Diplolepis californica* Kinsey on *Rosa*, species. Four specimens June, 1919, at Forest Hill, Mass., from *Diplolepis ignota* (Osten Sacken) Kinsey. Three specimens April 12, 1920, La Grange, Oreg., from *Diplolepis bassetti* (Beutenmuller) Kinsey.

27. *CALLIMOME TUBULARIS*, new species

*Female.*—Length 3.75 mm.; ovipositor 4.5 mm. Green with a strong cupreous tinge in some lights. Head and thorax equal in width; face finely sculptured and densely clothed below the antennae with rather long white appressed hairs; antennae attached a little below the middle and separated by a poorly developed carina; scape somewhat flattened, the lower part yellow beneath, the rest gradually shading into light brown then into dark brown; flagellum brown; pedicel equal in length to the first funicle joint; the ring-joint a little wider than long; the joints of funicle nearly all one and one-half times as long as wide, except the last which is considerably shorter; eyes red; the ocellular line about one and one-half times the diameter of ocellus; the distance between a posterior ocellus and the anterior ocellus a little less than the diameter of an ocellus. Thoracic dorsum minutely rugose; posterior one-half of the mesoscutum and the scutellum somewhat flattened, the extreme apical edge of the latter smooth; propodeum smooth, shining, cupreous, metapleura also cupreous; fore coxae bronzy at the base, the tips yellowish; mid coxae greenish brown, the tips yellowish; hind coxae bronzy; front pairs of femora and tibiae yellow, the hind femora mostly yellow but infuscate medially on the outside; the tarsi light yellow; wings strongly ciliate, the marginal veins seven-tenths as long as the submarginal, and the stigmal vein petioled; veins light brown. Abdomen green, the ventral area brown with a cupreous tint; longer than the thorax and slightly subcompressed, the first four segments deeply incised medially; tubularly produced posteriorly.



*Male*.—Thorax green with a cupreous reflection in some lights. Abdomen depressed. Color essentially same as in female. (The head and hind legs of the only male specimen were missing.)

*Type locality*.—Colorado.

*Host*.—Unknown.

*Type*.—Cat. No. 25324, U.S.N.M.

Described from three females and one poorly preserved male, collected by Engleman on willow. The female type, male allotype, and one paratype are in the National collection. There is one paratype in the author's collection.

28. *CALLIMOME STROBILOIDES*, new species

Figure 51

*Female*.—Length 3.5 mm.; ovipositor 4.25 mm. Thorax bright green, the abdomen bluish-green. Head about as wide as the thorax and very strongly depressed; face finely reticulately punctuate and clothed sparsely with short white hairs; antennae separated by a low broad carina; antennae with scape brown testaceous, darker at tip; flagellum very dark brown, rather slender, all joints longer than wide and of nearly equal width, the club swollen; pedicel and ring-joint combined equal to the first joint of funicle, the ring-joint distinctly wider than long; funicle and club clothed with very closely set short hairs; vertex narrow and more coarsely rugose than face; the posterior ocellus one and one-half times the length of the diameter of an ocellus from the eye margin. Thoracic dorsum minutely reticulately punctured, the reticulations on the anterior portion of the mesocutum more elongate than on the posterior; parapsidal grooves distinctly marked but not deep; entire dorsum with irregularly placed impressions; propodeum smoothly reticulated and with a very distinct but not high carina; fore coxae infuscate; mid coxae slightly greenish brown; the hind coxae greenish brown above and infuscate at the tips; rest of legs yellow ferruginous, the hind femora and hind tibiae a little darker; tarsi yellow, except the tips which are brown; wings ciliate, veins pale brown, the marginal vein three-fifths as long as the submarginal, and the stigmal vein petioled. Abdomen longer than the head and thorax combined; viewed from the side the dorsal line not straight; strongly subcompressed but not carinate.

*Male*.—Unknown.

*Type locality*.—Columbus, Ohio.

*Host*.—*Rhabdophaga strobiloides* (Walsh) on *Salix chordata* Muhlenberg.

*Type*.—Cat. No. 25351, U.S.N.M.

Described from three females. The type reared by the author. One female paratype, recorded under Bureau of Entomology No. 215°, reared April 13, 1887, from *Rhabdophaga strobiloides* (Walsh)

on *Salix*, species collected at Richfield, N. Y., is in the National collection. There is one female paratype in the author's collection reared from the same species of gall on *Salix amygdaloides* Anderson, July 20, 1920, at Cedar Point, Ohio.

29. *CALLIMOME SAPFORENSIS* (Ashmead)

Figure 44

*Torymus sapporensis* ASHMEAD, Journ. New York Ent. Soc., vol. 21, p. 82.

*Type locality*.—Japan.

*Host*.—Unknown.

*Type*.—Cat. No. 7145, U.S.N.M.

One female type in the United States National Museum.

30. *CALLIMOME JAPONICUM* (Ashmead)

Figure 54

*Torymus japonicus* ASHMEAD, Journ. N. Y. Ent. Soc., vol. 12, June 1904, p. 82.

*Type locality*.—Japan.

*Host*.—Unknown.

*Type*.—Cat. No. 7144, U.S.N.M.

Described from one male specimen in the National collection. The specimen is not properly mounted for study.

31. *CALLIMOME FLAVIVENTRE* (Ashmead)

Figure 68

*Torymus flaviventre* ASHMEAD, Bull. 3, Kans. State Agr. Coll., Appendix, p. 4, 1888.

*Female*.—Length 3.5 mm.; ovipositor 2 mm. Thorax green. Head transverse and about as wide as the thorax; viewed from the front minutely reticulated and very sparsely clothed with feeble white hairs; antennal groove shallow and somewhat cupreous; scape yellowish, pedicel yellow infusate, the funicle and club intense black but clothed rather sparsely with white hairs; pedicel and first joint of funicle about equal in length, the latter just a little longer but only four-fifths as wide; the succeeding funicle joints gradually growing shorter and wider toward the tip; vertex bluish-green; the ocellocular line one and five-sevenths times as long as the lateral ocellar line. Thorax with a slight bluish tinge; dorsum minutely rugosely punctate with several irregularly placed impressions; thoracic grooves not deep but all very distinctly marked; anterior lines of scutellum forming very near a right angle, but not coming to a distinct point; scutellar apex somewhat shining; mesepimeron shining brown, except the posterior portion which is dark green; propodeum moderately reticulated; fore and mid coxae, and the hind coxae, except the basal two-thirds which is greenish-brown, and all the rest of the legs entirely and uniformly pale testaceous; wings ciliate,

veins pale brown; marginal vein not quite three-fourths as long as the submarginal and the stigmal vein petioled. Abdomen distinctly longer than the thorax; greenish-brown dorsally, the sides dark brown with tints of green, except the ventral one-third which is testaceous; rather strongly subcompressed and carinate ventrally; sides clothed sparsely with gray hairs; ovipositor not much longer than the abdomen.

*Male*.—Unknown.

*Type locality*.—Riley County, Kans.

*Host*.—Unknown.

*Type*.—Cat. No. 25398, U.S.N.M.

This species is redescribed from the female type taken by C. L. Marlatt in September.

32. *CALLIMOME MISSOURIENSIS*, new species

Figure 69

*Female*.—Length 2.5 mm.; ovipositor 1.75 mm. Thorax bluish-green. Head a little wider than the thorax; face minutely reticulated and moderately clothed with rather long semiappressed white hairs; carina low and extending to the margin of the shallow depression that surrounds the antennal groove; scape bright yellow, except a little fuliginous tinge at the extreme tip above; scape not cylindrical; flagellum brown, pedicel and first funicle joint equal in length, the ring-joint a little wider than long; joints of funicle of nearly equal width but gradually growing shorter toward the tip, the first three or four distinctly longer than wide, the last joint distinctly wider than long. Thorax rather elongate and convex; dorsum reticulately punctate, with numerous irregularly placed shallow impressions and many rather long conspicuous white hairs; parapsidal furrows well defined for their entire length, the posterior of each curving outward; propodeum finely reticulated and shining in the middle; fore coxae entirely yellow, mid coxae mostly fuliginous, hind coxae greenish brown and coarsely punctured above, brown and more finely sculptured below; femora and tibiae yellow, except the hind tibiae which are infusate; tarsi yellow; wings rather strongly ciliate, veins flavo-testaceous, marginal vein about five-sixths as long as submarginal; stigmal vein petioled. Abdomen bluish and a little shorter than the thorax; rather strongly subcompressed; antero-dorsal area violaceous purple in some lights; segments medially emarginate, the sides sparsely clothed with short white hairs; ovipositor longer than the abdomen.

*Male*.—Length 2 mm. Thorax cyaneous with tinge of green. Scape dark green, flagellum fuscous; eyes reddish; fore coxae yellow with a very slight brownish tinge; hind femora and tibiae very strongly infusate. Abdomen short and depressed.

*Type locality*.—Cadet, Mo.

*Host*.—*Cecidomyia*, species, gall on stems of *Rubus*, species.

*Type*.—Cat. No. 25395, U.S.N.M.

Described from six specimens from the type locality recorded under Bureau of Entomology No. 721p° and reared April 28, 1883, from material collected by J. G. Barlow; and one female under the same number reared March 13, 1891, from material collected at Providence, Ind., by F. M. Webster. The female type, male allotype, and two female and one male paratypes are in the National collection. A male and female paratype from the type locality are in the author's collection.

33. CALLIMOME ASTERIDIS, new species

Figure 58

*Female*.—Length 3.2 mm; ovipositor 1.8 mm. Body green; thorax bluish in some lights, rather elongate and finely reticulately punctate dorsally. Head transverse and very much wider than the thorax; face minutely sculptured and clothed sparsely with very feeble hairs; carina separating antennae not prominent; the antennal depression very shallow; scape orange yellow, flagellum brown; pedicel about as long as first joint of funicle and as long as wide; all joints of funicle longer than wide although the last one is very little longer and somewhat wider than the first; ocelli amber, eyes purplish red ocellocular line equal to the diameter of an ocellus. Mesoscutum posteriorly flattened; scutellum convex; scutellar cross furrow not conspicuous, but the apical end of the scutellum more finely sculptured than the anterior; propodeum finely reticulated and somewhat smooth; fore coxae and legs entirely yellow, except the mid coxae which are tawny and the hind coxae which are brownish below and greenish above, the tips of each yellowish; last joint of tarsi brown; wings strongly ciliate; veins light brown; the marginal vein three-fourths as long as the submarginal and the stigmal vein petioled and very oblique. Abdomen as long as thorax, rather strongly subcompressed and mostly green; first three segments distinctly medially incised; antero-dorsal area tawny with a lavender tint in some lights, the sides brownish ventrally.

*Male*.—Length 2 mm. Scape fuscous, flagellum brown and densely pubescent; pedicel as long as first funicle joint and ring-joint combined; first funicle joint about one-fourth shorter than the second, and the succeeding four not much longer than wide; fore coxae with a greenish brown tinge at the base; other coxae darker than in female; rest of legs testaceous, except the hind femora and hind tibiae which are infuscate in the middle. Abdomen fuscescent and with a very conspicuous pubescence.

*Type locality*.—Holderness, N. H.

*Host*.—*Cecidomyia*, species, gall on Aster.

*Type*.—Cat. No. 25365, U.S.N.M.

Described from one female type and one male allotype in the United States National Museum and reared by A. Koebele May 21, 1884. These specimens are recorded under Bureau of Entomology No. 3231.

34. *CALLIMOME ATRIPLICIS*, new species

Figure 45

*Female*.—Length 2.5 mm; ovipositor 1.2 mm. Thorax aeneous in some lights; abdomen darker. Head viewed from front finely reticulate and very strongly cupreous in some lights and at certain angles; scape brown testaceous, flagellum brown, the pedicel darker and longer than the first funicle joint; joints of funicle not all longer than wide but of nearly equal width; eyes dark red. Thoracic dorsum with a roughly reticulated surface and conspicuously clothed with white recumbent hairs; propodeum moderately reticulated; coxae dark coppery green, the pleura dark cupreous and entirely reticulated; mesepimeron shining coppery, except the posterior part which is greenish; femora and tibiae testaceous, tarsi citrine except the last joint which is brown; wings strongly ciliate, veins pale testaceous, the stigmal vein petioled. Abdomen green with an aeneous reflection dorsally and laterally in some lights, except the first segment which is without a coppery reflection; first four segments medially incised.

*Male*.—Unknown.

*Type locality*.—Los Angeles County, Calif.

*Host*.—Cecidomyid gall on *Atriplex canescens* (Pursh) Nuttall.

*Type*.—Cat. No. 25402, U.S.N.M.

Described from two females collected by A. Koebele, June, 1887, and recorded under Koebele No. 229°.

35. *CALLIMOME KINSEYI*, new species

Figure 99

*Female*.—Length 2.8 mm.; ovipositor 2.5 mm. Thorax metallic green with cupreous reflections; minutely sculptured; abdomen dark green. Head strongly transverse and as wide as thorax; viewed from the front produced anteriorly, very strongly depressed and green with a golden tinge in some lights; antennae separated by a prominent carina which extends nearly to the mouth; scape fuscous with a bronzy tinge; flagellum brown the pedicel and ring-joint darker; pedicel a little longer than the first joint of funicle, all joints of which are distinctly longer than wide but increasing slightly in width toward the tip; each joint of funicle clothed with regularly and widely placed light-brown hairs that are almost as long as a joint itself. Thoracic dorsum not heavily clothed with white hairs; parapsidal furrows well defined; the scutellar cross furrow not conspicuous; scutellar apex cupreous; pleura very cupreous the depressions green; propodeum moderately reticulately punctate; coxae bronzy, femora and tibiae ferruginous at tips the middle brown outwardly, and the

hind femora fuscous; first two tarsal joints citrine, the next two ferruginous and the last one brown; wings strongly ciliate, veins brown; marginal vein five-eighths as long as submarginal the stigmal vein petioled. Abdomen a little longer than the thorax; not strongly subcompressed, the posterior somewhat tubularly produced; dark green, shining and medially emarginate; sparsely clothed with long hairs; ovipositor one and one-half times as long as the abdomen.

*Male*.—Length 2.25 mm. Scape fuscous; all joints of funicle wider than long, and very densely pubescent; femora and tibiae infuscated, the hind femora dark green and the hind tibiae fuscous. Abdomen shorter than the thorax and strongly depressed.

*Type locality*.—Inyo, Calif.

*Host*.—Dipterous gall on *Artemisia*, species.

*Type*.—Cat. No. 25361, U.S.N.M.

Described from four females and five males reared from a gall April 9, 1887, and recorded under Koebele No. 428. One female type, one male allotype, and five paratypes are in the National collection; two paratypes, with the same data, are in the author's collection. There are also two specimens under Bureau of Entomology No. 5089° reared June 30, 1891, from a gall formed by *Trypeta*, species on *Chrysothamnus viscidiflorus* (Hooker) Nuttall (*Bigelovia douglasii* Gray) collected by E. A. Schwarz at American Fork, Utah.

36. *CALLIMOME PILULARIDIS*, new species

Figure 72

Closely related to *Callimome baccharidis*, new species, but separated by the color of the hind femora and tibiae.

*Female*.—Length 2.25 mm.; ovipositor 0.9 mm. Thorax greenish-brown and finely sculptured; abdomen shining fuscous. Head transverse and decidedly wider than the thorax; viewed from the front minutely reticulated and sparsely clothed with short white hairs; green fuscous; antennal depression enlarged including most of the face, the depression as deep as the diameter of the scape plus that of the flagellum; antennae separated by a strongly developed carina; scape dark green and extending three-fourths the distance to median ocellus; flagellum fuscous and somewhat shining; the pedicel a little longer than the ring-joint and first funicle joint combined; ring-joint not quite as long as wide, all joints of funicle gradually growing wider toward the tip, but all a little longer than wide; each funicle joint clothed with regularly arranged and widely separated testaceous hairs that are almost as long as a joint; eyes fuliginous. Thorax elongate and conspicuously clothed with rather long white bristly hairs; parapsidal furrows well defined; scutellar apex not so deeply sculptured as the anterior portion; the scutellar cross furrow not definite; propodeum rather smooth, the anterior margin with numerous small pits; coxae brownish, the hind ones with a greenish tinge; femora and tibiae

shining light brown, except a little lighter at the tips; the hind femora and tibiae much darker; tarsi with basal half citrine; wings strongly ciliate; marginal vein two-thirds as long as submarginal, the stigmal vein petioled. Abdomen as long as thorax, slightly subcompressed and dorsally depressed; segments medially emarginate; conspicuous white hairs on sides; ovipositor a little shorter than abdomen.

*Male*.—Length 2.5 mm. Scape greenish brown; thorax rather robust, and with a cupreous tinge; legs darker than in female.

*Type locality*.—Martinez, Calif.

*Host*.—*Prosoma*, species on *Baccharis pilularis* De Candolle.

*Type*.—Cat. No. 25355, U.S.N.M.

Described from two males and two females reared in January, 1883. The female type, male allotype, and one paratype in the National collection. One female paratype is in the author's collection. These specimens are recorded under Bureau of Entomology No. 2964°.

37. CALLIMOME BACCHARIDIS, new species

Figure 57

*Female*.—Length 2.5 mm. ovipositor 1.2 mm. Head and thorax green with a cupreous tinge; thoracic dorsum minutely sculptured. Head transverse and a little wider than the thorax; face bronzy in some lights and clothed with weak appressed hairs; antennae separated by a rather prominent carina which extends one-half the distance to the margin of the mouth; scape rather cylindrical, mostly brown, but yellowish underneath; flagellum fuscous; pedicel shining and longer than the first joint of funicle, the ring-joint as long as wide; joints of funicle very slightly longer than wide and with a single row of regularly arranged and widely placed tawny hairs around each, giving a distinctly keeled appearance; antennal depression shallow; the distance between the margin of eye and posterior ocellus and between the posterior ocellus and median ocellus equal; eyes reddish. Posterior part of mesoscutum with larger reticulations and punctures than the scutellum which is very finely reticulated and with conspicuous but smaller, shallow impressions; entire dorsum covered with rather long white hairs which are longest on the apical end of scutellum; propodeum smooth and coppery; fore coxae green on the outside and brown inside; mid coxae more uniform greenish-brown, the hind ones brownish underneath and green and coarsely sculptured above; rest of legs testaceous, except the tarsi; tarsi citrine, except the last joints which are brown; wings strongly ciliate, veins light brown; the marginal vein about five-sevenths as long as submarginal; stigmal vein petioled the uncus long and not definitely terminated. Abdomen about as long as thorax, green with a brownish tint; first four segments deeply incised medially; ovipositor about same length as abdomen.

*Male*.—Length 2.2 mm. Scape greenish brown; legs yellow ferruginous except the hind femora, which are greenish brown on the outside, and the hind tibiae, which are dark testaceous in the middle. Abdomen strongly depressed.

*Type locality*.—San Francisco, Calif.

*Host*.—*Cecidomyia*, species gall on *Baccharis pilularis* De Candolle.

*Type*.—Cat. No. 25364, U.S.N.M.

Described from 11 females and 4 males recorded under Bureau of Entomology No. 4° reared July 16, 1885. The female type, male allotype, and 11 paratypes in the National collection; two paratypes are in the author's collection.

38. *CALLIMOME LONGISTIGMUM*, new species

Figure 50

*Female*.—Length 3 mm.; ovipositor 2 mm. Green and minutely sculptured. Head as wide as thorax; face finely sculptured and sparsely clothed with whitish hairs; antennae separated by a low and rather broad carina; area below the carina somewhat coppery; antennal depression shallow, aeneous near the base of the antennae; vertex broad and more coarsely sculptured, slightly rugose; ocelli amber; the ocellocular line twice as long as the lateral ocellar line, and not quite two-thirds as long as the post ocellar line; scape yellow beneath, about one-fourth yellowish above, the rest shading into brown; flagellum fuscous; pedicel shorter than the ring-joint and first funicle joint combined; the ring-joint as long as wide; all joints of funicle of nearly equal length but gradually growing a little wider toward the tip, clothed with short hairs and a row of longer and yellowish hairs regularly arranged and widely placed. Thoracic dorsum gently convex, and cupreous; minutely reticulately rugulose; anterior end of scutellum truncate; metanotum smooth and shining, the propodeum also feebly sculptured; the pits on the anterior margin of propodeum very small and few; coxae all green, femora and tibiae yellow, the femora with a very slight greenish brown tinge in the middle, the hind femora and tibiae infuscated in the middle; tarsi light yellow; wings strongly ciliate, veins light brown; marginal vein a little less than three-fourths as long as submarginal, the stigmal vein petioled. Abdomen green with a chalybeous tint and shorter than the thorax; first three segments strongly incised; sides fuscescent; ovipositor a little longer than abdomen.

*Male*.—Length 1.75 mm. Head strongly depressed; scape green but somewhat brownish at the base. Thorax elongate. Otherwise similar to female.

*Type locality*.—Los Angeles County, Calif.

*Host*.—Woody gall on willow—*Cecidomyia*, species.

*Type*.—Cat. No. 25359 U.S.N.M.



Described from six females and three males collected by D. W. Coquillett. One female type, a male allotype, and five paratypes in the National collection. Two paratypes are in the author's collection.

39. *CALLIMOME CITRIPES*, new species

Figure 67

Resembles *Callimome coloradensis*, new species, but is separated as indicated in the key.

*Female*.—Length 3.3 mm.; ovipositor 3 mm. Uniform green. Head transverse and very distinctly wider than the thorax; viewed from the front less than five-sixths as long as wide, entirely dark green and finely sculptured; clothed rather densely below the antennae with long appressed hairs; antennae separated by a low carina; scape cylindrical, the lower part yellow-testaceous on the outside, the rest brown to fuscous with a tinge of green; pedicel and first joint of funicle about equal, the ring-joint a little wider than long; funicle fuscous and somewhat shining through the pubescence; all joints of funicle longer than wide, although the last joint is very little longer than wide; antennal depression shallow, with a brassy tint, the median ocellus within its apex; ocelli red, eyes reddish-brown. Thoracic dorsum entirely dark green and clothed with short silvery white hairs; mesoscutum and scutellum rather convex; metanotum smooth, shining; propodeum smooth, weakly reticulated and green; coxae green with a bronzy reflection at the tips, the rest of legs except tarsi, ferruginous; tarsi whitish-yellow, the tips brown; stigmal vein petioled. Abdomen about as long as thorax, rather depressed above; all segments except the first distinctly but not deeply reticulated; first four segments medially incised the second and third most deeply, and all, including only the margin of the first, with a purplish tinge; sides densely clothed with white hairs that are nearly three-fourths as long as the width of the exposed part of the segments.

*Male*.—Length 3 mm. Green. Antenna with joints of funicle almost as wide as long, scape dark green; eyes maroon. Coxae dark green, all femora dark greenish-brown on the outside, the hind femora almost all dark green; hind tibiae fuscous, the others yellow-ferruginous; tarsi yellow. Abdomen as long as thorax; depressed.

*Type locality*.—Fort Garland, Colo.

*Host*.—*Euaresta tricolor* Doane on *Artemisia tridentata* Nuttall.

*Type*.—Cat. No. 25393, U.S.N.M.

Represented in the National collection by the type series which consists of one female type, one male allotype, and one male paratype reared July 3, 1883, and recorded under Bureau of Entomology No. 3129°.

## 40. CALLIMOME COLORADENSIS, new species

## Figure 70

*Female*.—Length 2.5 mm.; ovipositor 2.5 mm. Body green, the thorax metallic and abdomen shining. Head wider than thorax; front minutely sculptured and somewhat depressed in the region of the antennal attachment; front of head rather densely clothed with white appressed hairs; scape flattened, not reaching to the median ocellus, about two-thirds of the lower side yellow, the tip and upper side brownish; flagellum brown, the pedicel and ring-joint fuscous; pedicel and ring-joint combined longer than the first joint of funicle, the ring-joint as long as wide; all joints of funicle longer than wide; eyes and ocelli red. Thoracic dorsum finely sculptured and moderately clothed with silky white hairs; parapsidal grooves well defined; propodeum feebly reticulated and shining; mesepimeron very deeply incised, coppery; coxae green; fore and mid legs mostly yellow-ferruginous, but with the femora lightly infuscated outside, the hind ones greenish brown except the tips; tibiae infuscated in the middle the hind one very dark; last two joints of tarsi brown; wings strongly ciliated, veins light brown; marginal vein three-fourths as long as the submarginal, the stigmal vein petioled. Abdomen very slightly sub-compressed; segments medially incised, emarginate; ovipositor longer than abdomen.

*Male*.—Length 2 mm. Scape entirely dark green; first joint of funicle distinctly longer than wide; ocellocular line no longer than the long diameter of post ocellus. Abdomen shorter than the thorax.

*Type locality*.—Fort Garland, Colo.

*Host*.—*Cecidomyia*, species gall on *Artemisia*, species (Sage Brush).

*Type*.—Cat. No. 25363, U.S.N.M.

Described from nine females and five males reared June 25–27, 1883, by F. L. Bruner and recorded under Bureau of Entomology No. 3120<sup>22</sup>. The female type, male allotype, and 10 paratypes in the National collection. Two paratypes are in the author's collection.

## 41. CALLIMOME PERPLEXUM, new species

## Stigmal vein similar to Figure 41

This species is separated from all others in the genus by the dusky wings, as indicated in the key. The sculpture of the thoracic dorsum is also unique. In all other respects it is typically a *Callimome*.

*Female*.—Length 5 mm.; ovipositor 11 mm. Thorax atropurpureus with a bluish tinge; the abdomen same color. Head as wide as thorax; face finely rugose and with shallow umbilicate impressions; antennae separated by a prominent carina; two broad brown lines extending from the antennae to margin of mouth; scape fuscous with greenish tinge, flattened and attached about the middle of head and reaching

above the anterior margin of median ocellus; pedicel greenish-brown, the rest of flagellum brown; pedicel and ring-joint combined equal to the first joint of funicle; first and second funicle joints equal, the third distinctly shorter but all longer than wide and of nearly equal width; ocelli brunneous, the eyes maroon, posterior ocelli the length of their diameter from margin of eyes. Thoracic dorsum with crimson tints in some lights and with a coarse rugosity that is very shining; rugosity on the scutellum not transverse; scutellar cross furrow well defined, the scutellar apex feebly but distinctly reticulated; propodeum with several semilongitudinal wrinkles, the anterior margin punctured; coxae and femora, except tips, same color as thorax, the latter brown inside; tibiae ferruginous, tarsi citrine, except the last joint, which is testaceous; wings with a dusky area in the middle, veins brown; marginal vein one-half as long as submarginal, the stigmal vein sessile. Abdomen strongly subcompressed; first four segments deeply incised dorsally.

*Male*.—Unknown.

*Type locality*.—Ashland, Oreg.

*Host*.—*Disholcaspis maculipennis* (Gillette) on *Quercus garryana* Douglas.

*Type*.—Cat. No. 25339, U.S.N.M.

Described from a single female reared August 9, 1915, from a gall collected by J. M. Miller and recorded under Hopkins U. S. No. 12595b<sup>2</sup>.

#### 42. *CALLIMOME CRUENTATUM*, new species

Figure 26

*Female*.—Length 2.25 mm.; ovipositor 0.7 mm. Body mostly crimson. Head wider than the thorax, mostly crimson but fuscous below the antennae; antennae attached below the middle of front and separated by a poorly developed carina; antennal scape yellow testaceous, long, but not attaining height of the median ocellus; flagellum light brown and shining; pedicel longer than the first joint of funicle and ring-joint combined, the latter much wider than long; first funicular joint appearing nearly quadrate when seen from side, the following joints increasing gradually in width, the last about one-third wider than long; eyes almost same color as head but not shining; post ocelli distinctly nearer the eye margin than to the median ocellus. Thoracic dorsum minutely reticulately rugose; prothorax very short and margined posteriorly with a shining band; mesocutum anteriorly wider than long; parapsidal furrows well defined and black; scutellar cross furrow hardly apparent, indicated by a faint bluish line seen at certain angles; propodeum smooth, light brown with a crimson tinge in some lights; coxae crimson fuscous, femora and tibiae brown, the hind ones darker but all with a crimson tint; last joint of tarsi yellow,

otherwise pale yellow; wings moderately ciliate, marginal vein four-fifths as long as submarginal, the stigmal vein sessile. Abdomen shorter than thorax, mostly crimson, with a deep undertone of light brown, the anterior portion with a flavo-testaceous blotch dorsally; segments one and two conspicuously incised; ovipositor shorter than abdomen.

*Male*.—Length 2 mm. Crimson fuscous. Antennae entirely light brown. Otherwise similar to female.

*Type locality*.—Connecticut.

*Host*.—Cynipid, gall on leaf of *Quercus virginiana* Miller.

*Type*.—Cat. No. 25319, U.S.N.M.

Described from one female type and male allotype and two female paratypes reared March 27 to April 28, 1882, by William Wittfield, and recorded under Bureau of Entomology No. 2605°. The galls were described as "depressed on upper side with center somewhat elevated; grayish yellow; lower side projecting." One female paratype is in the author's collection; the remainder of the type series is in the National collection.

#### 43. CALLIMOME MULTICOLOR, new species

##### Figure 29

This species may be separated from all others by the comparative length of the first funicle joint.

*Female*.—Length 2.75 mm.; ovipositor 1.2 mm. Cupreous in reflected light; tinged with green in natural light. Head transverse, wider than the thorax; viewed from the front five-sevenths as long as wide and very strongly depressed; scape, except at base, cupreous, long, slender, and extending to the median ocellus; pedicel cupreous, the rest of the flagellum brown; pedicel almost as long as first and second funicular joints, but not as long as wide; first joint of funicle about one-half as long as the second, the other joints gradually growing wider toward the tip; vertex highly rugose; ocelli pinkish, the eyes red. Thoracic dorsum minutely reticulately rugose; parapsidal furrows distinct and green; sculpture of the scutellum longitudinally rugose, the cross furrow indicated only by a less deeply sculptured apex; propodeum smooth and shining; wings moderately ciliate, veins brown; marginal vein two-thirds as long as the submarginal, the stigmal vein sessile; femora and tibiae cupreous, the hind ones with a greenish tinge; tarsi testaceous, the last joint brown. Abdomen aeneous with a fuscous shade in some lights; ovipositor as long as abdomen.

*Male*.—Unknown.

*Type locality*.—Los Angeles County, Calif.

*Host*.—Gall on *Ephedra*, species

*Type*.—Cat. No. 25341, U.S.N.M.

Described from two females recorded under Koebele No. 2380 and taken by A. Koebele May, 1887. Both specimens in the National collection.

44. *CALLIMOME KOEBELEI*, new species

Similar to Figure 23

Easily separated from all other species by the delicate sculpture of the dorsum and its obscure parapsidal furrows.

*Female*.—Length 2.3 mm.; ovipositor 2.75 mm. Thorax delicate green with a slight brassy tint on the anterior part of mesoscutum in some lights. Head as long as wide; viewed from the front finely reticulated and strongly depressed; face, below the scape, clothed with very conspicuous white appressed hairs, a row of hairs bordering margin of eyes; scape attached much below the middle of front and not extending more than three-fourths the distance to the median ocellus; scape and pedicel greenish-brown; rest of flagellum clothed with ochraeous pubescence; pedicel much longer than the ring-joint and first funicle joint combined, the first funicle joint not more than one-third as long as the second, the second about as wide as long and the rest slightly longer than wide and gradually increasing in width toward the tip; ocelli a little more than one and one-half times the diameter of an ocellus from the eye margin. Thoracic dorsum somewhat flattened and microscopically transversely reticulately rugose on the mesoscutum and the scapulae, sculpture exceedingly delicate; parapsidal furrows very obscure being indicated only by a delicate line; cross furrow on scutellum not deep but well indicated by a difference in the sculpture of the scutellum; reticulations before the furrow more or less longitudinal or fan-like and behind the furrow transverse; scutellar apex rounded apically; propodeum nearly vertical, shiny, and with a number of pits on the anterior margin on each side of the middle; somewhat purpurescent with violet tinge ventrally; coxae, femora, and tibiae fuscous, the femora behind somewhat greenish; hind coxae brown with violet tinge above; veins yellow; marginal vein a little more than twice as long as the submarginal, the stigmal vein sessile. Abdomen rather strongly compressed and darker than the thorax.

*Male*.—Length 1.5 mm. Body dark green; femora dark green the tibiae fuscous.

*Type locality*.—San Francisco, Calif.

*Host*.—Cecidomyid gall on *Baccharis pilularis* De Candolle.

*Type*.—Cat. No. 25407, U.S.N.M.

Described from 17 specimens reared from the above named host July 16, 1885, and recorded under Koebele No. 402. The female type and male allotype and 13 paratypes in the National collection. Two paratypes are in the author's collection.

45. *CALLIMOME LIVIDUM* Ashmead.

## Figure 7

*Callimome lividus* ASHMEAD, Trans. Amer. Ent. Soc., vol. 12, 1885, Proc., p. xiii, No. 8.

*Torymus lividus* (Ashmead) ASHMEAD, Trans. Amer. Ent. Soc., vol. 14, 1887, p. 188.

The original description is as follows:

*Female*.—Length 2.5 mm.; ovipositor 1.5 mm. Deep blue. The space back of eyes and face above mouth, metallic green; apical portion of scutellum and metathorax smooth, not punctured; legs rufous with femora above blue; tarsi honey yellow. The two apical abdominal segments are green and the ovipositor is black, excepting a pale spot at the base.

*Type locality*.—Jacksonville, Fla.

*Host*.—Unknown.

*Type*.—Cat. No. 25321, U.S.N.M.

Ashmead described this species from two specimens taken at large. It had never been given a type number nor entered in the type book. Only one specimen labeled as this species was found in the collection; the head and abdomen are entirely gone and parts of the legs are missing. However, after careful study of the parts remaining, I am convinced that this specimen is one of the types.

In addition to the description above I have noted the following:

The thoracic dorsum is finely transversely reticulated, the reticulations being elongate; the scutellar apex is shining; the femora and hind tibiae are shining brown and the other tibiae ferruginous; the hind coxae are purpurescent with a crimson tint in some lights. Stigmal vein sessile.

46. *CALLIMOME DRYOPHANTAE* (Ashmead)

## Figure 23

*Syntomaspis dryophantae* ASHMEAD, Trans. Amer. Ent. Soc., vol. 14, 1887, p. 187, No. 21.

*Female*.—Length 2.3 mm.; ovipositor 1.8 mm. Mostly bronzy brown with a slight greenish reflection in some lights. Head distinctly wider than the thorax; seen from above minutely sculptured and with numerous silvery bristles below the antennae and with a row of short white bristles along the margin of the eyes; almost destitute of hairs above the antennae; scape light brown with a few short stout whitish bristles, the flagellum brown; ocelli and eyes reddish. Thorax minutely, transversely reticulately rugose; parapsidal grooves scarcely perceptible appearing only as dark lines; scutellum more finely sculptured than the mesoscutum; the scutellar cross furrow a little beyond the apical one-third; scutellar apex very feebly sculptured and hence highly polished; front coxae brownish, metapleura, mid and hind coxae with a brilliant crimson tint, except at the tips of coxae; femora and tibiae light brown, the tarsus whitish

except the last joint which is brownish; stigmal vein sessile; the marginal vein five-sixths as long as the submarginal. Abdomen as long as thorax; antero-dorsal area light brown, the rest fuscous; feebly reticulated; first, second, and third segments incised medially and almost emarginate; ovipositor brown.

*Male*.—Unknown.

*Type locality*.—Jacksonville, Fla.

*Host*.—(*Dryophanta*) *Neuroterus catesbaei* (Ashmead) on *Quercus catesbaei* Michaux.

*Type*.—Cat. No. 25318, U.S.N.M.

I have redescribed this species from a single type female from which Ashmead drew his description. There are, however, two specimens in the National collection labeled "*Syntomaspis lissus* Walker" and "*Syntomaspis theon* Walker" by Ashmead. Both of these specimens were taken at Jacksonville, Fla., and are so badly mutilated that it has been difficult to study them. It is certain that they are not identical with the species as described by Walker. After comparing them with the type specimens of *Callimome dryophantae* (Ashmead) I am convinced that they are both identical with it.

#### 47. CALLIMOME ANTHOMYIAE (Ashmead)

##### Figure 22

*Torymus anthomyiae* ASHMEAD, Trans. Amer. Ent. Soc., vol. 14, 1887, p. 189, No. 28.

*Female*.—Length 1.8 mm; ovipositor 1.3 mm. Robust and shining, bronzy brown with purple tinge in reflected light. Head as wide as thorax; face minutely reticulate; ocelli amber color; scape yellowish except tips which are light brown; flagellum brown, the club and funicle pubescent; first joint of club three times as wide as the first joint of funicle which is as wide as long; vertex more coarsely sculptured than face. Thoracic dorsum minutely punctate and clothed sparsely with short white hairs; parapsidal grooves poorly defined, especially near the juncture with the scutellum; dorsum rather strongly convex; scutellar cross furrow seen only at certain angles; sculpture on the scutellar apex more shallow than on the anterior portion of scutellum, the apex slightly shining; coxae and femora same color as thorax, except that the tips of the femora are yellowish; tibiae testaceous the central portions brownish; tarsi yellowish, except the last joint, which is brown; veins of wings light yellow, the stigmal vein sessile; marginal vein five-sixths as long as the submarginal. Abdomen uniform brown and shining; sheath of ovipositor fuscous.

*Male*.—Unknown.

*Type locality*.—Jacksonville, Fla.

*Host*.—Unknown.

*Type*.—Cat. No 2887, U.S.N.M.

This species is redescribed from two specimens in the National collection. It is most closely related to *Callimome dryophantae* (Ashmead) and *Callimome aeneum* Ashmead, but is decidedly more robust than either of them, besides differing in minor details.

Ashmead wrote that he suspected that this species was parasitic on an Anthomyiid larva which he found mining the leaves of a cultivated plant.

48. *CALLIMOME AENEUM* Ashmead

Figure 11

*Callimome aenea* ASHMEAD, Trans. Amer. Ent. Soc., vol. 9, 1881, Proc., p. xxxiii.

*Callimome dryorhizoxeni* ASHMEAD, Trans. Amer. Ent. Soc., vol. 12, 1885, Proc., p. xiii, No. 9.

*Syntomaspis aeneus* (Ashmead) ASHMEAD, Trans. Amer. Ent. Soc., vol. 14, 1887, p. 187.

*Syntomaspis dryorhizoxeni* (Ashmead) ASHMEAD, Trans. Amer. Ent. Soc., vol. 14, 1887, p. 187.

*Torymus omnivorae* ASHMEAD, Trans. Amer. Ent. Soc., vol. 14, 1887, p. 188, No. 26.

*Female*.—Length 2.3 mm; ovipositor 2.3 mm. Mostly brown, aeneous in some lights. Head three-eighths as long as wide; face finely reticulately rugose with irregularly placed shallow impressions, from which silvery white hairs arise; antennae separated by carina, which is long extending nearly to margin of mouth; scape ochraeous, the flagellum brown; joints of funicle a little longer than wide and each joint with minute longitudinal keels about three-fourths its length; club as long as the two preceding joints, the first joint of club very distinctly wider than the first joint of funicle; eyes reddish, ocelli amber. Thoracic dorsum finely reticulately rugose and rather sparsely clothed with moderately long whitish hairs; parapsidal grooves feebly impressed; irregularly placed shallow impressions on the dorsum scarcely visible; furrow separating the mesoscutum and scutellum deeply impressed and dark; scutellar cross furrow distinct, the scutellar apex less deeply sculptured than the rest of scutellum, without hairs and slightly polished; propodeum without carinae or lateral folds; coxae fuscous, trochanters light brown, femora brown except the tips, tibiae light brown, tarsi whitish, except the tips which are fuliginous; veins of wings pale yellow, the stigmal vein sessile. Abdomen as long as the head and thorax combined; more or less tubular and with long silvery hairs on the margins of segments; first four segments medially incised.

*Male*.—Length 1.5 mm. Entire body including legs, except tarsi, fuscous.

*Type locality*.—Jacksonville, Fla.

*Host*.—*Andricus virens* (Ashmead).

*Type*.—Cat. No. 2826, U.S.N.M.



*Callimome aenea* was originally described from several specimens. The present type series in the National collection consists of six females, one of which has been selected as electotype. The males have apparently been lost. The redescription is drawn from the type series, except for the male, in which case I have used the old description with a few changes.

*Torymus omnivorae* Ashmead and *Callimome dryorhizoxeni* Ashmead have been treated above as synonyms. Of the former there were specimens including type, allotype, and paratypes, Type Cat. No. 2885 U.S.N.M., all labeled Jacksonville, Fla. These were reared from *Disholcaspis omnivora* (Ashmead). Ashmead writes that the scutellum has no transverse groove; in this he was mistaken. Of *Callimome dryorhizoxeni* Ashmead there is one type and one paratype labeled Jacksonville, Fla., Type Cat. No. 1335, U.S.N.M., reared from (*Dryorhizoxenus*) *Eumayria floridana* (Ashmead).

*Distribution*.—Jacksonville, Fla. (Types). In addition to the type series the National collection contains the following: Two specimens, Hopkins No. 15634g, reared December 13, 1919, and November 23, 1920, from leaf galls on *Quercus laurifolia* (Michaux) collected by L. H. Weld at Dayton, Fla. One specimen, Hopkins No. 15334f reared September 1, 1920, from *Andricus virens* (Ashmead) on *Quercus geminata* Small, collected by L. H. Weld at Clearwater, Fla. Six specimens labeled Jacksonville, Fla., and nine specimens with no data, but which I have good reasons to believe to be from Florida, are in the same lot. In the author's collection there is one female, Hopkins No. 15634g, with data as above.

#### 49. CALLIMOME DASYNEURAE, new species

Figure 10

*Female*.—Length 2.75 mm.; ovipositor 1.5 mm. Body bluish. Head blue-green, clothed sparsely with silvery white hairs, more densely so below the antennae; face minutely sculptured but with very shallow umbilicate impressions; antennae separated by a carina which is elevated strongly and extends one-third the distance to margin of mouth; antennae attached below the middle of front and in a rather deep groove; scape greenish-yellow, long, slender, and curved at the base; pedicel light brown, shining, robust, and longer than the first joint of funicle; flagellum light brown; last joint of funicle almost twice as wide as first joint, all more or less rectangular; eyes pinkish bordered with a row of minute short appressed hairs; ocelli very small and yellowish; the post ocelli a little more than twice the short diameter of an ocellus from eye margin; ocelli almost twice as wide as long. Thoracic dorsum reticulately punctate and cyaneous; nearly as wide as the distance from the tip of scutellum to a point

including the posterior one-third of the pronotum; clothed with inconspicuous reddish hairs; scutellar cross furrow well defined but not deep, the sculpture on the scutellar apex shallow; scutellum, anterior to the cross furrow, with a longitudinal depression through the center which has a greenish reflection and is more finely reticulated; propodeum shining; fore and hind coxae bluish-brown the hind coxae purplish; femora all bluish-brown, the inside brownish; tibiae all brown; tarsi pale yellow, except the tips, which are light brown; wings moderately ciliate, veins yellow; marginal vein about four-fifths as long as the submarginal; stigmal vein sessile. Abdomen, seen from above, ovate and slightly depressed, the anterior one-third with a slight yellowish under shade; third, fourth, and fifth segments almost truncate except very minute medial incisions; ovipositor four-fifths as long as abdomen.

*Male*.—Length 1 mm. Essentially as the female only much darker.

*Type locality*.—Wooster, Ohio.

*Host*.—*Dasyneura almea* Felt.

*Type*.—Cat. No. 25334, U.S.N.M.

Described from six females and one male reared by J. S. Houser at Wooster, Ohio. The type female, male allotype, and four paratypes are in the National collection; one paratype is in the author's collection.

#### 50. *CALLIMOME THALASSINUM* (Crosby)

##### Figure 1

*Syntomaspis thalassinus* CROSBY, Can. Ent., vol. 40, 1908, p. 143.

*Type locality*.—New York.

*Host*.—*Harmolita*, species.

*Type*.—In the Cornell University collection.

I have not examined the type of this species. There are in the National collection 16 specimens of this species identified by A. B. Gahan, whose identification I have confirmed.

*Distribution*.—Ithaca, Amsterdam, Lake Keuka, Oneonta, Kingston, Cranberry Creek, Remsen, Elmira, Lowville, Bluff Point, Cortland, and Victor, N. Y., reported by Crosby. In the National Museum are the following: Four females and eleven males reared from timothy August, 1913. One male reared by C. N. Ainslie March 26, 1914, at Lewisville, Minn., recorded under Webster No. 8877. One female and two males from Waterloo, N. Y., collected by W. J. Phillips and recorded under Webster No. 9354. In the author's collection are two females taken by A. E. Miller, July 15, 1921, in sweepings from a timothy meadow on the Ohio State University farm, Columbus, Ohio.

The nearest known relative of *Callimome thalassinum* (Crosby) is *rohweri* which occurs on the western coast of the United States. The two species may be separated by a difference in sculpture.

51. *CALLIMOME ROHWERI*, new species

## Figure 19

Closely allied to *Callimome thalassinum* (Crosby) but is separated by a distinct difference in the sculpture of the thoracic dorsum and in color, *rohweri* having a distinct bluish tinge.

*Female*.—Length 2.75 mm.; ovipositor 1.3 mm. Thoracic dorsum distinctly reticulately punctured and with a decided bluish-green color; abdomen deeply and widely reticulated, bluish. Head transverse, a little wider than the thorax and anteriorly produced; transversely rugose below the antennae, but vertically rugose between the eyes; face clothed with very weak silvery hairs which are longest near the margin of the mouth; antennae attached below the middle of head and separated by a short carina; scape yellow beneath, green for about two-thirds its length, cylindrical and reaching to median ocellus; pedicel blackish green, the rest of flagellum black; pedicel almost as long as ring-joint and funicle joint combined; ring-joint about twice as wide as long; ocelli and eyes reddish brown; the posterior ocelli one and one-half times the diameter of an ocellus from the eye margin. Pronotum and mesoscutum finely reticulately rugose, the parapsidal furrows black and well defined; furrow between the mesoscutum and scutellum very deep; anterior of the scutellum with more minute reticulations than the posterior portion, the rugosity on the scutellum more or less longitudinal instead of transverse; posterior part of mesoscutum more deeply punctate than the anterior; scutellar cross furrow well defined though not deep, the scutellar apex somewhat shining; metanotum and propodeum smooth, feebly reticulate, a few moderate-sized pits on the anterior margin; coxae and femora dark bluish green, except at the tips and inside, which are brownish; tibiae mostly ferruginous, bluish green in the middle outside; tarsi yellowish to light brown; wings moderately ciliate, veins yellow; the marginal vein two-thirds as long as the submarginal, the stigmal vein sessile. Abdomen mostly dark green with a bluish tinge, the first segment green and shining, the others metallic green with purplish margins; first three segments deeply incised; viewed from the side somewhat rounded and tubular; ovipositor as long as abdomen.

*Male*.—Length 2.3 mm. Scape dark green, all joints of flagellum wider than long; lateral ocellar line about equal to the ocellocular line; legs brownish with a slight greenish tinge. Abdomen depressed.

*Type locality*.—Rio Vista, Calif.

*Host*.—*Lolium temulentum* Linnaeus containing *Harmolita*, species.

*Type*.—Cat. No. 25336, U.S.N.M.

Described from three females and one male. The female type was reared June 3, 1920, by B. G. Thompson and is recorded under Sacramento No. 20432. The male allotype was reared August 10, 1918,

by C. M. Packard from *Lolium temulentum* Linnaeus containing *Harmolita*, species (?) collected at Hercules, Calif., and is recorded under Berkley No. 1829. One male reared March 14, 1919, otherwise with date as above. The three mentioned specimens in the National collection. One specimen reared June 3, 1920, from *Lolium multiflorum* Lamarck containing *Harmolita*, species collected 'at Rio Vista, Calif., and recorded under Sacramento No. 20431 is in the author's collection.

## 52. CALLIMOME PUNCTIFRONS (Ashmead)

### Figure 8

*Syntomaspis punctifrons* ASHMEAD, Jour. Linn. Soc. Lond. Zool., vol. 25, 1894, p. 154.

The original description follows:

*Male*.—Length 2 mm. Bronze green, polished, and sparsely covered with a whitish pile; face with rather coarse punctures and a median carina below the insertion of the antennae; scape knees, tibiae, and tarsi reddish yellow; flagellum brown-black, the joints about one and one-half times as long as thick. Collar triangular; mesonotum a little longer than wide, with distinct furrows; scutellum with a cross furrow at two-thirds its length; wings hyaline, the venation whitish the marginal vein almost as long as the submarginal, stigmal very minute.

I am including the original description of the type of this species. It was described from one male specimen which is probably in the British Museum and which I have not seen. In the United States National Museum there is one female of the species which was labeled as this species and is referred to in the Transactions of the Entomological Society of London,<sup>11</sup> but not described.

*Female*.—Length 2.7 mm.; ovipositor 3.5 mm. Dark green, tinged with black with a rather coarse transverse reticulately punctate rugulose dorsum. Head transverse and wide as thorax; viewed from the front green with a strong coppery tinge; face clothed quite densely with rather long white appressed hairs that arise from numerous and unusually large punctures, the space between the punctures minutely reticulated; antennae separated by a well developed carina which extends nearly to the margin of the mouth; scape yellow ferruginous, rest of flagellum light brown; pedicel and ring-joint ferruginous; pedicel as long as first joint of funicle, the latter two-thirds as long as the second funicle joint but distinctly longer than wide; other funicle joints decidedly longer than wide and with very conspicuous constrictions in the middle, giving each of them a double aspect; ocelli maroon and nearly in a straight row; the ocellular line, the lateral ocellar line and a line extending from the mid ocellus to the foraminal margin about equal in length; eyes bright red. Mesoscutum with a coarse rugosity and clothed with conspicuous white hairs;

<sup>11</sup> 1900, p. 253.

parapsidal furrows well defined; scutellum more finely sculptured than the mesoscutum; scutellar cross furrow very distinct; the apex of scutellum not so coarsely sculptured; propodeum rather smooth, the anterior margin along the outer one-third on each side of the middle, with pits; coxae greenish brown with a crimson tinge in some lights; femora infuscated in middle with a greenish tint on the outside; tibiae testaceous; veins of wings pale yellow; marginal veins five-eighths as long as the submarginal; stigmal vein sessile. Abdomen shining dark green, the medially emarginate sides clothed with rather long white appressed hairs.

Described from one female from Grenada, West Indies, collected by H. H. Smith.

*Type locality*.—St. Vincent.

*Host*.—Unknown.

Until both sexes of this species are taken together it can not be definitely said that the sexes have been correctly associated but Ashmead had determined the female described above as conspecific with the male and I have thought best to allow his determination to stand.

53. *CALLIMOME TUBICOLA*, Osten Sacken

Figure 31

*Callimome tubicola* OSTEN SACKEN, Trans. Amer. Ent. Soc., vol. 3, 1870, p. 60, No. 4.

*Syntomaspis advena* (Osten Sacken) ASHMEAD, Trans. Amer. Ent. Soc., vol. 14, 1887, p. 187. (Misidentification.)

*Female*.—Length 2.75 mm; ovipositor 3.5 mm. Metallic green. Head wider than the thorax; viewed from the front about five-sixths as long as wide; front reticulately rugose, the area below the antennae with more large shallow impressions than the area above and clothed with stout whitish hairs; face with a reddish-brown tinge below the antennae; eyes reddish; scape yellowish, slender and not reaching to the median ocellus; flagellum brown; pedicel and ring-joint together not equaling the first funicle joint; ring-joint twice as wide as long; all joints of funicle longer than broad, the club scarcely longer than the two preceding joints; all joints of funicle of equal width. Thoracic dorsum minutely transversely reticulately punctate and with numerous shallow impressions irregularly placed; thorax rather robust and with a very slight brassy tint in some lights; scutellum much flattened, punctures minute but rather deep, the central area with the smallest punctures; scutellar cross furrow plainly indicated by a bluish line; scutellar apex not so deeply sculptured and somewhat polished; propodeum smooth but with a slight indication of a carina; fore, mid, and lower one-half of hind coxae greenish brown, the upper half of the latter brownish crimson and deeply sculptured; trochanters and femora all greenish brown except the tips, the hind femora

darker green; fore and mid tibiae fuscous except the tips, the hind tibiae entirely fuscous; first three joints of tarsi whitish, the rest yellowish brown; veins of wings yellow, the marginal vein five-sevenths as long as the submarginal; stigmal vein sessile. Abdomen greenish brown, the first four segments more shining green above and medially incised.

*Male*.—Length 1.5 mm. Blackish green. Flagellum fuscous; joints of funicle not all longer than wide. Legs darker than in female. Otherwise similar to female.

*Type locality*.—Washington, D. C.

*Host*.—*Andricus tubicola* (Osten Sacken).

*Type*.—In the Museum of Comparative Zoology, Cambridge.

I have not seen the type, but I have described the species from a series of specimens some of which were compared with the type of *Callimome tubicola* Osten Sacken by Nathan Banks. The types of my descriptions are labeled as such.

*Distribution*.—Washington D. C. (Type.) The National collection contains the following: Three specimens under Bureau of Entomology No. 158<sup>20</sup>, reared February 13, 1884, from *Andricus flocci* Walsh on *Quercus macrocarpa* Michaux, collected by A. Koebele at Washington, D. C. Three specimens Hopkins No. 12020j, reared June 13, 1913, from *Andricus seminator* Harris on *Quercus alba* Linnaeus, collected by W. Middleton, Falls Church, Va. Three specimens, Hopkins No. 12056j, reared June 25, 1914, with the same data as Hopkins 12020j. Seven specimens, Hopkins No. 13651i, reared June 16 to July 27, 1916, from *Andricus operator* Osten Sacken on *Quercus marylandica* Muenchausen, collected by W. Middleton at Falls Church, Va. Thirty-five specimens, Hopkins No. 13602, reared June 5 to July 29, 1915, from *Andricus seminator* Harris on *Quercus alba* Linnaeus collected by W. Middleton, at Falls Church, Va. Two specimens, Hopkins No. 10703c, reared May 7, 1913, from *Disholcaspis globulus* Fitch on *Quercus prinus* Linnaeus, collected by S. A. Rohwer at Falls Church, Va. One specimen, Hopkins No. 13603d, reared June 28, 1915, from *Amphibolips coccinea* (Osten Sacken) Ashmead, on *Quercus rubra* Linnaeus, collected by W. Middleton at Plummer Island, Md. One specimen, Hopkins No. 11356b, reared April 12, 1913, from a species of Argidae. *Quercus*, species, collected by C. T. Greene at Blythedale, Md. Eight specimens, Hopkins No. 13630v, reared May 6, 1916, and October 18, 1915, from *Andricus flocci* Walsh on *Quercus minor* (?) Sargent, collected by A. B. Champlain at Lyme, Conn. Seven specimens, Hopkins No. 13676b, reared August 29, 1917, collected by L. C. Griffith in Georgia; no further data. Six specimens bearing Bureau of Entomology No. 3190<sup>0</sup>, reared April 18, 1883, from a Cynipid gall on *Quercus*, species, collected by Barlow in Missouri. Thirty-two specimens Bureau of Entomology No. 3086<sup>0</sup>, reared June

28 to July 24, 1883, from *Andricus seminator* Harris, with no further data. Two specimens, Hopkins No. 8699j', reared July 7, 1912, from *Andricus seminator* Harris on *Quercus alba* Linnaeus, collected by A. D. Hopkins at Kanawha Station, W. Va. One specimen determined by Ashmead as *Syntomaspis advena* Osten Sacken and reared from *Andricus petiolicola* (Bassett) Mayr bearing Brodie No. 57. Three specimens from Louisiana with no further data other than labeled *Quercus*, species. In the author's collection there are three specimens, Hopkins No. 13685e, reared April 5, 1918, from *Disholcaspis globulus* (Fitch) on *Quercus alba* Linnaeus, collected by W. Middleton at Falls Church, Va. Six specimens reared from *Andricus seminator* (Harris) on *Quercus*, species, collected by A. E. Miller at Wooster, Ohio, July 27, 1920.

54. CALLIMOME MEXICANUM (Ashmead)

Figure 37

*Torymus mexicanus* ASHMEAD, Ent. News, vol. 10, 1889, p. 195.

The original description follows:

*Female*.—Length 4 mm; ovipositor 6.5 mm. Head and thorax metallic green, the hind margin of mesopleura violaceous followed by a bright cupreous band; abdomen bronzed black; flagellum black; scape, tegulae and tarsi bronzish-yellow; coxae metallic green; anterior femora toward base and the hind femora except tips, metallic brown, the rest of the legs rufous, wings hyaline. The veins, except the subcosta at base, dark brown. Head shagreened and punctate, the face clothed with a white pubescence; mandibles ferruginous, the teeth black. Thorax sparsely pubescent, transversely shagreened and punctured, the punctures more distinct and coarser along the hind margin of the pronotum, on the parapsides along the furrow of the same, and on the scutellum. Mesopleurae except the hind margin sculptured, the hind margin smooth, impunctate. Hind coxae large, reticulately sculptured. Abdomen finely or microscopically reticulated, the dorsal flap bluish.

*Male*.—Length 3.2 mm. Agrees well with the female in color and in the structure of the head and thorax, but the tegulae and head are bluish-green, the tibiae dark brown, the tarsi, except the terminal joint, whitish, while the abdomen is bluish-green, scarcely as long as the thorax, with the dorsal flap bright green.

I have examined the type series, which consists of two females and one male, in the National collection, and add the following:

The head and thorax are distinctly bronzy green with a shading into brown; thoracic furrows and the scutellar cross furrow are well defined; stigmal vein is sessile; propodeum with a V-shaped inverted carina.

*Type locality*.—Guanajuato, Mexico.

*Host*.—*Andricus championi* (Cameron) Ashmead.

*Type*.—Cat. No. 4306, U.S.N.M.

In the original description it is said that *mexicanum* was described from "one female." On the same page *Synergus dugesi* Ashmead was described from "one male and two female specimens." Examination of the types of both species shows that the number of speci-

mens of each species should be reversed. The museum type labels placed on these specimens by the describer proves that the published statement of the number of specimens is erroneous.

*Distribution*.—Guanajuato, Mexico (Type). In addition to the type series there are in the National collection nine specimens reared June 5, 1901, from a cynipid gall taken at Williams, Arizona, by H. S. Barber and E. A. Schwarz, and recorded under Bureau of Entomology No. 9411. Two specimens with the same data are in the author's collection.

The specimens from Arizona agree better than the types with the color given in the original description. The thoracic dorsum lacks the decided brownish tinge that is present in the types. Otherwise they are similar.

55. *CALLIMOME COERULEUM* Ashmead

Figure 40

*Callimome coerulea* ASHMEAD, Trans. Amer. Ent. Soc., vol. 9, 1881, Proc. p. xxxiii.

*Torymys coeruleus* (Ashmead) ASHMEAD, Trans. Amer. Ent. Soc., vol. 14, 1887, p. 188.

*Female*.—Length 5.5 mm.; ovipositor 7 mm. Uniform indigo-blue with tints of green in some lights. Head strongly transverse and a little wider than the thorax at the tegulae; eyes red, bulging, the inner margins parallel, ocelli almost in a straight line; face below scape more or less polished and with a greenish luster; minutely reticulately punctuate and with numerous shallow impressions from which short white hairs arise; area just above the mouth finely reticulate; facial carina prominent, the lower half greenish, finely transversely rugose; scape yellowish, pedicel and rest of antennae brown, the funicle and club joints clothed with short keel-like hairs; all joints of funicle longer than wide, the first joint almost twice as long as pedicel and ring-joint together. Thorax rather robust, convex except the area centering around the dorsal groove that borders the anterior of scutellum; dorsum rather finely transversely rugose with a few shallow impressions from which whitish hairs arise; cross furrow on scutellum very prominent, the scutellar apex slightly polished; wings moderately ciliate, the stigmal vein dark brown and sessile; marginal vein two-thirds as long as the submarginal and both light brown; coxae same color as the thorax, the hind ones coarsely reticulately punctuate outwardly; trochanters, femora and tibiae testaceous, tarsi light yellow, except the ungues, which are fuscous; the hind femora with very minute denticulations on the lower margin beyond the middle. Abdomen not quite as long as the thorax, inclined to be carinate dorsally but very feebly so; a little darker than the thorax; conspicuously but not deeply reticulated.



*Male*.—Length 4 mm. Scape testaceous, flagellum fuscous; fore and mid femora greenish-brown with a violaceous tinge on the basal two-thirds; the hind femora more distinctly brown on the basal one-half, the other ends testaceous; tibiae testaceous.

*Type locality*.—Jacksonville, Fla.

*Host*.—*Amphibolips cinerea* Ashmead.

*Type*.—Cat. No. 2825, U.S.N.M.

This species is represented in the National collection by the type series which consists of two males and seven females from which I have redescribed it. One female paratype is in the author's collection.

*Distribution*.—In addition to the type series there are 11 specimens recorded under Bureau of Entomology 2302 and reared from galls on live oak collected at Crescent City, Fla., on June 18, 1880, by H. G. Hubbard; also two specimens of them labeled "Duval County, Fla."

56. *CALLIMOME CASTANOPSIDIS*, new species

Similar to Figure 41

Resembles *Callimome gahani* Huber but is larger and more robust; and the position of the ocelli differs.

*Female*.—Length 4 mm.; ovipositor 5 mm. Thorax moderately dark green with a bluish tinge in some lights; abdomen cyaneous with purplish tints. Head transverse and seven-ninths as long as wide; viewed from the front minutely reticulated and with several shallow irregularly placed impressions; purplish brown below the antennae and clothed sparsely with short white hairs; median carina below insertion of antennae low and wide, the antennal depression shallow; scape long, cylindrical and pale ferruginous; flagellum brown, the funicle and club clothed with very short closely set hairs; pedicel and ring-joint combined scarcely as long as first joint of funicle; all joints of funicle distinctly longer than wide and equal in width; ocelli brownish; the ocellocular line equal to the length of long diameter of posterior ocellus. Thorax robust and strongly arched, the dorsum minutely reticulately punctate and clothed sparsely with short white hairs that arise from shallow impression; parapsidal grooves not deep but well marked with shining black lines; scutellar cross furrow indicated by a shining blue line; scutellar apex as widely but not so deeply sculptured as the anterior of scutellum; propodeum feebly rugose longitudinally and somewhat polished, the anterior margin depressed and punctured on each side of a rather wide central area which is not pitted; fore coxae dark greenish brown, femora brown, the hind femora greenish brown; tibiae pale testaceous, the tarsi whitish yellow; veins of wings yellow, the marginal vein seven-tenths as long as the submarginal; stigmal vein sessile. Abdomen conspicuously but not deeply reticulated; moderately sub-

compressed, and as seen from the side rather strongly arched in the center; first four segments medially incised.

*Male*.—Length 2.6 mm. Antennae with all joints, except the last two, distinctly longer than wide and of equal width; scape brownish; tibiae brown, the hind ones fuscous. Abdomen with first segment green, the others purplish brown.

*Type locality*.—California.

*Host*.—Probably gall on *Castanopsis chrysophylla* by *Andricus castanopsidis* Beutenmueller.

*Type*.—Cat. No. 25337, U.S.N.M.

This species is described from 7 males and 16 females under Bureau of Entomology No. 3791<sup>\*</sup> and reared from "large, globular, brown" galls, presumably collected by A. Koebele in California; exact data as to the locality is not available. The galls were not *in situ* when found. The adults emerged from November 16, 1885, to January 8, 1886. Also nine specimens under Koebele No. 320° and reared from galls on *Quercus lobata* collected August, 1890, at Glen Ellen, Sonoma County, Calif., by A. Koebele; two specimens under Koebele No. 549° and reared from galls on *Quercus dumosa* collected October, 1889, in Sonoma County, Calif., by A. Koebele; one specimen under Koebele No. 688, reared from a gall on *Quercus dumosa* collected February 20, 1891, in the Santa Cruz Mountains, California, by A. Koebele; three additional specimens from Sonoma County, Calif., under Koebele Nos., 544°, 545°, and 109°. The type, allotype, and 35 paratypes are in the United States National Museum, and a male and female paratype (Bureau No. 3791<sup>\*</sup>) in the author's collection.

Attention is called to the fact that the host cited for the types was not determined. The description of the gall of *Andricus castanopsidis* Beutenmueller is somewhat similar to the description of the galls from which the parasites were reared.

#### 57. *CALLIMOME GIGANTICUM*, new species

#### Figure 38

Closely resembles *Callimome melanocerae* (Ashmead) but is larger and the thoracic dorsum is differently sculptured.

*Female*.—Length 5.5 mm.; ovipositor 8 mm. Thoracic dorsum dull green and very minutely punctured. Head almost wide as thorax; face minutely reticulated and green with purplish reflections on each side of the median carina which extends as far as the margin of the mouth; face also with numerous shallow impressions; antennal depressions shallow and coppery within; scape long, a little flattened and testaceous; flagellum brown, the pedicel and ring-joint fuscous and shining; pedicel and ring-joint combined not more than three-fourths as long as the first joint of funicle; first joint of funicle twice

as long as wide, the sixth and seventh not quite one and one-half times as long as wide, all of equal width and clothed with short closely set hairs. Thoracic dorsum minutely punctate and with no or very few shallow irregularly placed impressions; clothed very sparsely with feeble hairs; parapsidal furrows shallow; central portion of dorsum unusually wide and flat, the posterior part of the mesoscutum very wide and more deeply punctured than the anterior; anterior margin of scutellum widely punctate, a slight longitudinal depression extending from the anterior margin back to the scutellar cross furrow; scutellar cross furrow well defined the apex as widely but not so deeply sculptured; propodeum more or less coarsely sculptured the anterior margin with several large pits and the carina extending about three-fifths the distance posteriorly, the central area posteriorly with several feebly developed folds; coxae dark greenish blue, the hind coxae brown with a purple tint outwardly above; femora dark greenish blue, except the tips, which are testaceous; tibiae testaceous, tarsi mostly yellow, the tips brown; wings sparsely ciliate, the marginal vein yellowish and five-sevenths as long as the submarginal which is brownish; stigmal vein sessile. Abdomen longer than the thorax and rather robust; two-thirds of basal segment shining green the apical portion brownish purple; rest of abdomen green with an undershade of brown and purple in some lights; first four segments deeply incised medially, the fifth with an unusually deep rounded incision.

*Male*.—Length 3.25 mm. Scape fuscous green; all joints of funicle longer than wide, the last joint very slightly longer. Thoracic dorsum with a purplish tinge in some lights; coxae, femora and hind tibiae green, with a tinge of dark purple; the other tibiae not so dark and somewhat testaceous at tips and inwardly.

*Type locality*.—Tepic, Mexico.

*Allotype locality*.—Grant's Pass, Oreg.

*Host*.—Cynipid gall on *Quercus*, species (Type). *Disholcaspis maculipennis* Gillette on *Quercus garryana* Douglas (Allotype).

*Type*.—Cat. No. 25317, U.S.N.M.

Described from several specimens. The type and allotype are deposited in the National collection. Six paratypes are in the author's collection.

*Distribution*.—Tepic, Mexico, Bureau Entomology No. 5722°. Type.

Allotype and two paratypes reared from *Disholcaspis maculipennis* Gillette on *Quercus garryana* Douglas, collected by A. C. Kinsey at Grant's Pass, Oreg., April 7, 1920. One specimen reared from *Andricus pacificus* Ashmead, on *Quercus chrysolepis* Liebmann, collected by Kinsey at Ukiah, Calif., March 17, 1920. Three specimens reared from *Disholcaspis corallina* (Bassett), collected at Merced Falls, Calif., by Kinsey.

There is some variation in color in this species. The thorax may have a purplish or a brassy tinge in some lights. In specimens that have been studied the sculpture is constant.

58. CALLIMOME MELANOCERAE Ashmead

Figure 34

*Callimome melanocerae* ASHMEAD, Trans. Amer. Ent. Soc., vol. 12, 1883, Proc., p. xiii, No. 10.

*Callimome citriformis* ASHMEAD, Trans. Amer. Ent. Soc., vol. 12, 1885, Proc., p. xiii, No. 11.

*Syntomaspis melanocerae* (Ashmead) ASHMEAD, Trans. Amer. Ent. Soc., vol. 14, 1887, p. 187.

*Syntomaspis citriformis* (Ashmead) ASHMEAD, Trans. Amer. Ent. Soc., vol. 14, 1887, p. 187.

*Female*.—Length 3.2 mm.; ovipositor 5.5 mm. Metallic green, the thoracic dorsum not punctate. Head wider than thorax, transverse, green, the face with a golden tinge and minutely reticulately rugose with several large shallow impressions; facial carina low but extending very near to clypeal margin; scape ferruginous, flagellum blackish; pedicel and ring-joint combined shorter than first funicle joint; the ocellocular line and lateral ocellar line about equal in length and not quite as long as the diameter of mid ocellus. Thoracic dorsum minutely transversely reticulately punctate, the mesoscutum conspicuously rugose, the scutellum more punctate, posterior margin of mesoscutum aeneous; scutellum somewhat longitudinally depressed and more finely punctured near the anterior margin; scutellar apex with shallow sculpture and shining; propodeum feebly rugose the anterior margin with small punctures; marginal veins two-thirds as long as submarginal, the stigmal vein sessile; coxae green and moderately clothed with white hairs, trochanters bronzy, inner sides of femora infuscated and with a purplish tinge, the exterior green and clearly reticulated, the outer tip ferruginous; tibiae ferruginous, the tarsi pale yellow. Abdomen nearly as wide as the thorax and about as long; feebly reticulated; first four segments feebly incised.

*Type localities*.—Jacksonville, Fla.

*Host*.—*Amphibolips melanocerae* (Ashmead).

*Type*.—Cat. No. 25345, U.S.N.M.

This species is redescribed from the type specimen. In addition to the type of *melanocerae* the National collection contains the type of *Callimome citriformis* Ashmead (cited in synonymy above) reared from *Amphibolips citriformis* (Ashmead) Dalla Torre, Jacksonville, Fla. These two types are similar in every respect. In Ashmead's description it is stated that in *Callimome citriformis* the joints of the flagellum have an unusual character. Examination of the antennae revealed that they were still covered with the pupal sheath, which was probably unnoticed by Ashmead, hence his statement. *Callimome citriformis* Ashmead bears the type Cat. No. 25346, U.S.N.M.

*Distribution.*—In addition to the type specimens mentioned above the National collection contains the following: Two specimens, Hopkins No. 15634a, reared November 9 to November 14, 1919, from *Disholcaspis terrestris* Weld on *Quercus margaretta* Ashmead, collected by L. H. Weld at Ocala, Fla. One specimen, Hopkins No. 15634b, reared May 12, 1920, from *Disholcaspis polita* Bassett on *Quercus chapmani* Sargent, collected by L. H. Weld at Ocala, Fla. Three specimens, Bureau of Entomology No. 989<sup>a</sup>, reared September 12 to 28, 1881, from *Amphibolips globulus* Beutenmeuller from *Quercus*, species, Atlanta, Ga. One specimen, Hopkins No. 12072, reared June 27, 1914, from *Amphibolips inanis* Osten Sacken on *Quercus rubra* Linnaeus collected by W. Middleton at Plummer Island, Md. Two specimens, Hopkins No. 13608a, reared June 28 to August 9, 1915, from *Amphibolips coccinea* (Osten Sacken) Ashmead on *Quercus rubra* Linnaeus collected by W. Middleton at Falls Church, Va. Three specimens, Hopkins No. 12052a, reared June 13, 1914, by W. Middleton at Falls Church, Va. One specimen, Hopkins No. 12025, reared April 27, 1914, from *Disholcaspis globulus* Fitch on *Quercus alba* Linnaeus collected by W. Middleton, Falls Church, Va. One specimen, Bureau of Entomology No. 158<sup>20</sup>, reared February 13, 1884, from *Andricus flocci* Walsh on *Quercus macrocarpa* Michaux collected by A. Koebele at Washington, D. C. In the author's collection there is one specimen, Hopkins 12052a, with data as above.

53. *CALLIMOME COCCINEUM*, new species.

Similar to figure 40

Most closely allied to *Callimome melanocerae* (Ashmead) but differs greatly in the type of the sculpture of the thorax and is smaller.

*Female.*—Length 3.5 mm.; ovipositor 5 mm. Thorax shining green with an aeneous tint in some lights; abdomen mostly green but with a definite purplish brown area in the center dorsally. Face bronzy below the antennae and sparsely clothed with feeble hairs; facial carina short but high and entirely green; scape testaceous, flagellum brown; pedicel and ring-joint equal to the first joint of funicle, all joints much longer than wide and of equal width; vertex green with tint of blue; eyes and ocelli red; posterior ocellus the length of its short diameter from the eye margin. Posterior margin of pronotum with a purplish band; dorsum finely and shallowly reticulated except for many and very conspicuous punctures from which short hairs arise; rugosity transverse on mesoscutum and irregular on the scutellum, except for the scutellar apex which is transverse; scutellum with a longitudinal depression through the center which is more finely reticulated and bluish; scutellar cross furrow very distinct; propodeum smooth, except an almost inconspicuous carina and several punctures on anterior margin; coxae dark green, hind femora dark green, except

the tips; fore and mid tibiae brownish except the tips; fore and mid tibiae testaceous, the hind tibiae rather strongly infuscate; wings sparsely ciliate, veins pale testaceous, stigmal veins sessile. Abdomen shining dorsally, about as long as thorax and not as wide.

*Male*.—Unknown.

*Type locality*.—Falls Church, Va.

*Host*.—*Amphibolips coccinaeae* (Osten Sacken) Ashmead on *Quercus rubra* Linnaeus.

*Type*.—Cat. No. 28672, U.S.N.M.

Described from seven females.

*Distribution*.—Falls Church, Va. (type). Three specimens Hopkins 13607c (type) and *d* and *f*, and two specimens Hopkins No. 13608 *j* and *g*, reared August 9 to September 17, 1915, collected by W. Middleton and with data as above. These specimens are in the National collection. Two female paratypes reared September 3, 1918, from *Amphibolips confluentis* (Harris), collected at Blue Hills, Mass., by A. C. Kinsey, one of these in the author's collection.

60. CALLIMOME GAHANI, new species

Figure 35

*Female*.—Length 4 mm.; ovipositor 3.75 mm. Thorax robust, dorsum blue with tints of green and a few purplish spots in some lights; abdomen dark green. Face minutely reticulately rugose but with a few irregularly placed impunctations; blue green and with a few silvery hairs; facial carina transversely aciculated, the sides with short bristly hairs; antennae attached just a little below the middle, scape yellow and cylindrical; pedicel fuscous and about three times as long as the ring-joint which is one-third as long as wide; pedicel and ring-joint combined scarcely as long as the first joint of the funicle; flagellum brown with minute longitudinal keels arranged so as to give joints a double aspect; joints of funicle all longer than wide and of about equal length; eyes pinkish, ocelli amber; the ocellular line about one and one-fifth times the length of the long diameter or nearly twice the length of the short diameter of posterior ocellus; the lateral ocellar line exactly equal to the long diameter of post ocellus. Dorsum minutely reticulately punctate, and clothed with delicate hairs; parapsidal furrows deep and black; scutellum with a longitudinal depression which is more finely sculptured; scutellar cross furrow well defined, the apex of scutellum not so deeply sculptured; propodeum mostly smooth and shining; coxae fuscous blue; femora brownish inwardly and greenish brown outwardly and slightly pubescent; tibiae yellow; wings ciliate, veins yellow, except the stigmal vein which is brownish; stigmal vein sessile. Abdomen very feebly carinate dorsally; first four segments incised medially; area in region of first segment yellowish to light brown undershade.

*Male*.—Length 3.5 mm. Antennae darker than in female; tibiae light brown the hind ones darkest; submarginal veins distinctly brown, the marginal infuscated.

*Type locality*.—Ashland, Oreg.

*Host*.—*Cynipid* gall on *Quercus garryana* Douglas.

*Type*.—Cat. No. 25320, U.S.N.M.

Described from three specimens collected by J. M. Miller February 26, 1916, and recorded under Hopkins No. 12595f<sup>2</sup>. The female type, male allotype, and male paratype are in the National collection.

61. CALLIMOME BRODIEI (Ashmead)

Figure 33

*Syntamaspis brodiei* ASHMEAD, Trans. Amer. Ent. Soc., vol. 14, 1887, p. 187, No. 20.

*Male*.—Length 3.5 mm. Green, the thoracic dorsum with aeneous shades. Head transverse and minutely transversely punctate; face, below the antennae purplish brown and clothed sparsely with short white hairs; scape brownish green, flagellum fuscous; eyes reddish brown and rather strongly divergent toward the mouth; ocelli amber. Thoracic dorsum minutely transversely rugose and somewhat reticulated; sculptured with shallow impressions from which whitish hairs arise; scutellar cross furrow distinct but not deep, the scutellar apex slightly shining; mesonotum purplish green ventrally; coxae fuscous with a greenish tinge, femora lighter in color and the hind ones unusually hairy; tibiae yellow ferruginous, tarsi yellow. Abdomen flat dorsally but compressed ventrally; dark greenish brown and with long white hairs on the sides.

*Female*.—Facial carina scarcely evident; antennal depression shallow; pedicel and ring-joint combined not equal to first joint of funicle which is narrower than other funicle joints; joints of funicle gradually growing shorter toward the tip but all longer than wide, and except the first, of nearly equal width; ocelli light brown, the ocellular line about one and one-fourth times the length of the long diameter of the posterior ocellus; the lateral ocellar line hardly as long as the short diameter of a post ocellus; eyes reddish. Thoracic dorsum brown with bronzy and green tints; parapsidal furrows well marked but not deeply defined; scutellar cross furrow well defined, the scutellar apex as widely but not as deeply sculptured as the rest of scutellum; propodeum moderately sculptured, the anterior margin somewhat alveolate; carina conspicuous, and also with a few other longitudinal wrinkles and folds on the posterior half; all coxae dark bluish green; fore and mid femora fuscous, the hind femora greenish brown, except the tips; tibiae pale testaceous; veins of wings yellow, the stigmal veins sessile.

*Type locality*.—Toronto, Canada.

*Host*.—*Philonix pezomachoides* (Osten Sacken).

*Type*.—Cat. No. 25347, U.S.N.M.

This species was originally described from three specimens. It is now represented in the National collection by one male type and the head and thorax of a female allotype. I have redescribed it from these specimens. The gall of its host occurs on *Quercus alba* Linnaeus.

62. CALLIMOME AEREUM, new species

Similar to Figure 40

*Female*.—Length 3.75 mm.; ovipositor 2.75 mm. Thoracic dorsum aeneous. Face aeneous with tinges of purple; facial carina prominent; scape yellow, ferruginous and cylindrical; flagellum fuscous; the pedicel and ring-joint a little lighter and combined about the same length as the first joint of funicle; ring-joint four-fifths as long as wide; first joint of funicle one and three-fifths times as long as wide, the others gradually increasing in length toward the tip; last funicle joint very little longer than wide, all of equal width; head green below the foraminal margin; the ocellocular line slightly longer than the length of the long diameter of a posterior ocellus; the lateral ocellar line very distinctly shorter than the long diameter of posterior ocelli. Thoracic dorsum minutely transversely reticulately punctate and with a green tinge in some lights; parapsidal grooves green and well defined; scutellar cross furrow prominent; the scutellar apex as coarsely sculptured as before the cross furrow; propodeum coarsely sculptured, large punctures on the anterior one-fourth and with five or six well developed folds on the middle; prepectus and mesopleura indigote; coxae dark green, the femora brown with a shading of blue and green, except the tips which are testaceous; tibiae testaceous, tarsi whitish to testaceous; wings ciliate; marginal vein four-fifths as long as the submarginal, stigmal vein sessile. Abdomen as long and about as wide as the thorax; shining dark green with a purplish brown tint in some lights; margins of segments conspicuously shining; first four segments medially incised.

*Male*.—Length 3 mm. Carina on propodeum more conspicuous than in female. Abdomen much shorter than the thorax.

*Type locality*.—Boerne, Tex.

*Host*.—Leaf gall on *Quercus schneckii* Britton.

*Type*.—Cat. No. 25339, U.S.N.M.

Described from a large number of specimens, as indicated below, which are deposited in the National collection.

*Distribution*.—Two females and 12 males, Hopkins No. 13686c, reared August 20, 1918; two of the above number reared December 10, 1917, from the host mentioned above and collected by L. H. Weld,



at Boerne, Tex. Eighteen specimens, Hopkins No. 15634g, reared December 13, 1919, to November 23, 1920, from leaf galls on *Quercus laurifolia* (Michaux) at Dayton, Fla. Two specimens, Hopkins No. 10776a, reared May 14, 1919, from *Disholcaspis fasciata* Bassett on *Quercus rubra* collected at Ironton, Mo., by S. A. Rohwer. Sixteen specimens, Hopkins No. 1129a (and supernumbers) from Texarkana, Ark. Two specimens, Hopkins No. 12099, reared November 24, 1915, from *Disholcaspis fasciata* Bassett on *Quercus digitata* Sudworth, at Falls Church, Va., by W. Middleton. Thirty-eight specimens, mounted on compound points, reared from galls on *Quercus macrocarpa* Michaux (?) and recorded under Bureau of Entomology No. 435, collected near Washington, D. C. In addition to the above listed specimens in the National collection, two paratypes under Hopkins No. 13686c are in the author's collection.

63. CALLIMOME ROBUSTUM, new species

Similar to Figure 40

*Female*.—Length 4.5 mm.; ovipositor 3 mm. Head as wide as the thorax; viewed from the front bronzy brown; facial carina feebly developed; scape attached below the middle of the front, yellow, cylindrical, the flagellum dark brown, the pedicel shining and blackish; pedicel and ring-joint combined not as long as the first joint of funicle; pedicel three-fifths as wide as the first joint of funicle, the flagellum gradually increasing in width toward the tip; eyes prominent, slightly convergent toward the vertex. Thoracic dorsum bronzy with a green reflection; pronotum distinctly margined with a shining band; mesoscutum reticulately rugose and quite densely clothed with short semi-erect hairs; parapsidal grooves deep; axillae gradually rounded following the general contour of thorax; scutellum similarly sculptured, the cross furrow quite distinct and the apex somewhat shining; propodeum coarsely sculptured especially at the anterior margin where the pits are much longer than wide and extend two-fifths the distance posteriorly; area behind pits coarsely punctured and with several longitudinal wrinkles; coxae and femora, except the tips of the latter, dark green, the coxae and femora exceptionally deeply reticulated, the sculpture on the latter as deep as on the dorsum; femora slightly pubescent; tarsi yellowish-white; tibiae yellowish; wings moderately ciliate, veins yellow, stigmal vein sessile. Abdomen as long as thorax, flattened, and very dark green; first three segments incised dorsally, the fourth only slightly so; ovipositor one-third longer than the abdomen.

*Male*.—Unknown.

*Type locality*.—Carrabelle, Fla.

*Host*.—*Amphibolips fuliginosa* Ashmead; *Quercus phellos* Linnaeus or *laurifolia* (Michaux).

*Type*.—Cat. No. 25348, U.S.N.M.

Described from six (one type) females recorded under Hopkins No. 15633f and reared May 12 to September 1, 1920, from material collected by L. H. Weld. Type and four paratypes in the National collection; one paratype in the author's collection.

64. CALLIMOME BICOLORATUM, new species

Figure 14

*Female*.—Length 3.5 mm.; ovipositor 5 mm. Head and thorax blue-green and finely punctate; abdomen brownish bronze. Head as wide as the thorax, the face reticulately rugose and with a few larger but shallow punctures; silvery hairs quite numerous below the antennae; scape slender, straight, yellow, the flagellum brown; pedicel shining and together with the ring-joint longer than the first joint of funicle; all funicular joints not as long as wide but of nearly equal width; ring-joint as wide as long; two rows of hairs regularly arranged around each joint; eyes and ocelli red; post ocellar line nearly equal to thrice the length of the lateral ocellar line. Thoracic dorsum mostly minutely punctate but also with a few large shallow impressions; scutellum with a longitudinal line through the center due to finer punctation; scutellar cross furrow hardly apparent, the scutellar apex very slightly shining; propodeum polished, a few longitudinal carina at the lower exterior margin and some pits at the anterior margin; coxae and femora, except the tips of the first and second, light brown with a slight brassy green reflection; the hind coxae darker, the tibiae testaceous and the tarsi yellowish; pleura smooth and coppery; wings ciliate, veins yellowish, marginal vein two-thirds as long as the submarginal, the stigmal vein sessile. Abdomen distinctly longer than the thorax but not quite as long as the head and thorax combined, somewhat subcompressed but not carinate dorsally; first, second, and third segments deeply incised medially.

*Male*.—Length 2 mm. Scape greenish on the upper half; all funicle joints but the first and second wider than long; legs darker than in female. Abdomen depressed and shorter than the thorax.

*Type locality*.—Fort Grant, Ariz.

*Host*.—*Amphibolips trizonata* Ashmead on *Quercus*, species.

*Type*.—Cat. No. 25338, U.S.N.M.

Described from six females and nine males reared July, 1882, to January 10, 1883, from galls collected by H. K. Morrison and recorded under Bureau of Entomology No. 2668<sup>00</sup> and <sup>01</sup>; and six specimens reared August 14, 1889, from *Rhodites bicolor* Harris, collected at Aztec, N. Mex.; four paratypes are in the author's collection; others of the type series in the National collection.

65. *CALLIMOME HIRSUTUM*, new species

## Figure 20

*Female*.—Length 2.75 mm.; ovipositor 3.75 mm. Metallic green. Head transverse and as wide as thorax; face finely reticulately rugose below the antennae, vertically rugose above antennae to ocelli; densely clothed with short stout silvery white hairs; carina very prominent extending from between the antennae, where it is sharp and narrow, to the margin of the clypeus its median area being high and wide; scape tawny, flagellum light brown; all joints of funicle longer than wide; pedicel and first joint of funicle about equal in length, the ring-joint twice as wide as long; second joint of funicle one-fourth longer than first but slightly shorter than the third; ocelli and eyes reddish brown; posterior ocellus one and one-fourth times its diameter from the eye margin. Thoracic dorsum densely clothed with white hairs as on the head, the hairs longer on the sides of the pronotum; finely reticulately rugose; the parapsidal and other grooves distinct; scutellar cross furrow well defined although not deep; the scutellar apex distinctly but not deeply sculptured, and hence polished; coxae and femora blue green, the latter brown inwardly; tibiae brown, greenish tinge on the outside; tarsi whitish yellow, the last joint brown; wings moderately ciliate; marginal vein three-fifths as long as the marginal, the stigmal vein sessile. Abdomen dark brownish green; strongly subcompressed, the first four segments strongly carinate; the posterior segments densely clothed with hairs as on the thorax and head.

*Male*.—Length 2 mm. Scape stout; carina not touching margin of clypeus; tibiae darker than in female. Abdomen much shorter than the thorax.

*Type locality*.—Redington, Ariz.

*Host*.—Twig gall on *Quercus*, species.

*Tyre*.—Cat. No. 25331, U.S.N.M.

Described from two females and one male, Hopkins No. 13643y, reared, July 13 to July 29, 1916, from galls collected by M. Chrisman. The female type and male allotype are in the National collection. Paratype female in the author's collection.

66. *CALLIMOME CAPILLACEUM*, new species

## Figure 21

*Female*.—Length 2.5 mm; ovipositor 2 mm. Metallic greenish-brown. Head transverse and slightly wider than the thorax; viewed from the front somewhat triangular; reticulately rugose and rather densely clothed with short, stout, white hairs; facial carina extending nearly two-thirds the distance to the margin of mouth; scape yellow, long, and slender, reaching to the lower margin of median ocellus, the flagellum light brown; ring-joint twice as wide as long, the pedicel

nearly as wide as first joint of funicle and longer; funicle joints equal in length but gradually increasing in width toward the tip, each joint with a single row of regularly arranged and widely placed yellowish hairs; eyes brownish and widely divergent below; ocelli amber; median ocellus considerably larger than the posterior ocelli; vertex more coarsely rugose and a distinct greenish-brown. Thorax rather robust, the dorsum minutely aciculate rugose; parapsidal grooves represented by rather shallow black lines so that the reticulations appear to continue from one sclerite to the other; scutellum somewhat elevated at the anterior margin and rounded dorsally; scutellar cross furrow beyond the posterior one-third; scutellar apex as coarsely but not so deeply sculptured appearing polished at certain angles; mesoscutum and scapulae densely clothed with silvery hairs, the hairs less dense on the scutellum; coxae, trochanters, and femora greenish-brown, the femora slightly pubescent; tibiae yellowish, tips of tarsi brown; wings moderately ciliate, veins very pale yellow, the marginal vein about three-fourths as long as the submarginal, and the stigmal vein sessile. Abdomen longer than thorax; dark metallic green; almost flat dorsally; the first four segments medially incised; brown ventrally; ovipositor about one and one-half times as long as abdomen.

*Male*.—Unknown.

*Type locality*.—Fort Grant, Ariz.

*Host*.—Cecidomyid galls on stems of *Artemisia*, species.

*Type*.—Cat. No. 25330, U.S.N.M.

Described from nine females reared from galls collected by H. K. Morrison and recorded under Bureau of Entomology No. 2732°. The type female and six paratypes are in the collection of the United States National Museum. Two paratypes are in the author's collection.

67. *CALLIMOME HAINESI* (Ashmead)

Figure 12

*Torymus hainesi* ASHMEAD, Ent. News, vol. 4, 1893, p. 278.

*Callimome asphondyliae* GAHAN, Ann. Ent. Soc. Amer., vol. 12, 1919, pp. 161-2, not (*Torymus*) *Callimome asphondyliae* Kieffer and Jörgensen.

The following description, except for the single word in parenthesis, is Gahan's original:

*Female*.—Length 2.25 mm. Head and thorax shagreened above; face below antennae less strongly sculptured than the vertex; antennae rather short and thick; funicle joints subequal in length, but increasing slightly in breadth the apex and all joints broader than long, the first only slightly so, the last about half as long as thick; club not as long as the three preceding joints of funicle; ocelli in a low triangle, the lateral ocellus separated from the eye margin by about the long diameter of the ocellus; parapsidal grooves complete, but weakly impressed posteriorly; propodeum without carinae and uniformly shagreened, the sculpture not as strong as on the scutellum; hind femora outwardly sculptured about like the propodeum; wings sparsely ciliated the cilia more or less arranged in rows; stigmal vein very short (*sessile*), postmarginal also short; abdomen about equal

to the thorax in length, the first tergite smooth, other tergites weakly sculptured, more strongly so at the sides; ovipositor extending beyond apex of abdomen about one and one-third times the length of the abdomen. Color dull blackish green, the head and thorax sparsely clothed with silvery white hairs; eyes pale reddish; face, propodeum and hind femora and the abdomen more strongly metallic than the dorsum of the thorax; sides of thorax and hind coxae bluish; antennal scape and all tibiae and tarsi brownish testaceous; flagellum, median and front femora, tarsal claws and ovipositor sheaths brownish black; wings hyaline; venation pale brownish.

*Male*.—Length 2 mm. Tibiae all dark brown. Otherwise agrees with the female except the general color is perhaps a little darker.

Additional notes: The scutellar cross furrow is so inconspicuous that it can be seen only with difficulty, and is best indicated by a difference in the depth of sculpture before and behind it.

*Type locality*.—San Julio, Lower California.

*Host*.—*Asphondylia websteri* Felt.

*Type*.—Cat. No. 25333, U.S.N.M.

*Torymus hainesi* was described from three specimens taken in April, 1889, by C. D. Haines. The type series is represented by one female in the National collection and two specimens in the Museum of the California Academy.

*Distribution*.—In addition to the type of *hainesi* I have examined the following: Six females and two males reared at Tempe, Ariz., from the alfalfa midge (*Asphondylia websteri* Felt), these are the types *Callimome asphondyliae* Gahan and recorded under Type, Cat. 22296, U.S.N.M. Five males and one female reared from mesquite bean moth, July, 1913, Austin, Tex., collected by C. Hartman, are also in the National collection.

68. CALLIMOME TARSALE, new species

Figure 18

*Female*.—Length 2.75 mm.; ovipositor 2 mm. Thorax green with a brassy tint in some lights; face below antennae bronzy and finely sculptured but with numerous and rather strongly impressed umbilications; facial carina moderately developed, the upper half green and the lower half bronzy; metallic green above the antennae; eyes reddish and the ocelli reddish brown; scape yellow and not extending to the median ocellus; flagellum brown, the pedicel and ring-joint lighter brown than the funicle; pedicel and ring-joint combined about equal to the length of the first joint of funicle, which is about one-half longer than wide; the last funicular joint slightly wider than long. Thorax five-sixths as wide as head; pronotum and mesoscutum transversely rugose the scutellum concentrically rugose; hairs on dorsum scarcely apparent; scutellar cross furrow not strongly impressed and not dividing the scutellum at the apical one-third; scutellar apex very slightly polished at certain angles; propodeum with a rather square area in the middle with longitudinal rugosity and with rather strong

carinae on each side of the rectangular area and alveolate anteriorly; fore and mid coxae yellowish, with a tint of brown, the hind coxae with a purplish tinge; femora and tibiae all yellow, the tarsi whitish yellow; pleura and mesosternum brownish; wings moderately ciliate, veins pale yellow; marginal vein five-sixths as long as the submarginal and the stigmal vein sessile. Abdomen as long as the head and thorax combined and very slightly subcompressed; first three segments greenish, the remaining brownish green; fuscous ventrally.

*Male*.—Length 2.25 mm. Coxae, femora and tibiae all brown except the tips which are ferruginous. Abdomen depressed dorsally and shorter than the thorax.

*Type locality*.—Corpus Christi, Tex.

*Host*.—Cecidomyid ? gall on *Celtis*, species.

*Type*.—Cat. No. 25340, U.S.N.M.

Described from four females and seven males reared May 27 to July 3, 1895, and recorded under Bureau of Entomology No. 6626°. The female type, male allotype, and seven paratypes are deposited in the National collection. Two paratypes are in the author's collection.

The gall made by the host is described as "more or less globular when single, with a short nipple, pubescent."

#### 69. CALLIMOME MONTSEERRATI (Crawford)

##### Figure 2

*Torymus montseerrati* CRAWFORD, Proc. U. S. Nat. Mus., vol. 40, 1911, p. 441.

*Type locality*.—Montserrat, West Indies.

*Host*.—Unknown.

*Type*.—Cat. No. 13658, U.S.N.M.

Type series in the United States National Museum contains two females and three males. Two specimens not labeled as type material are in the same lot.

#### 70. CALLIMOME SATIVAE, new name

##### Figure 13

*Syntomaspis medicaginis* GAHAN, Ann. Ent. Soc. Amer., vol. 12, 1919, p. 162, preoccupied by *Torymus medicaginis* Mayr, Verh. zool. bot. Ges. Wien., vol. 24, 1874, p. 127.

*Type locality*.—Tempe, Ariz.

*Host*.—*Asphondylia websteri* Felt.

*Type*.—Cat. No. 22297, U.S.N.M.

Represented in the National collection as follows: Type females reared by V. L. Wildermuth from galls of the alfalfa midge, Webster No. 7268, Tempe No. 2264. One paratype with the same data, except Tempe No. 2251. Allotype, four male paratypes, and five female paratypes reared by E. G. Smyth at Tempe, Ariz., from galls of the same insects and recorded under the same Webster number. The wing of a female paratype is mounted on a slide. Stigmal vein sessile.

71. *CALLIMOME RUBENIDIS*, new species

Figure 15

*Female*.—Length 2.75 mm.; ovipositor 2.25 mm. Head as wide as the thorax; face below the antennae bronzy green, minutely reticulated and with a few large shallow impressions; rather densely clothed with short white hairs; facial carina extending one-half the distance to the mouth; vertex inaurate in some lights; scape yellowish, flagellum fuscous; pedicel and ring-joint longer than first joint of funicle, the first and second funicle joints longer than wide, the rest gradually growing shorter until they appear almost square; eyes maroon; foraminal margin brassy beneath. Thoracic dorsum green with a slight brassy tinge, minutely reticulately punctate and with a few large shallow impressions; scutellar cross furrow indicated by a shining line, the scutellar apex not so deeply sculptured as other parts of the scutellum and hence polished; propodeum moderately reticulated, the central area brassy, lateral folds at lower margin rather prominent; coxae purplish and depressed outside, femora and tibiae brown, except the tips of the latter which are yellowish; last joints of tarsi brown; wings moderately ciliate; marginal vein five-sevenths as long as submarginal; stigmal vein fuscous and sessile. Abdomen slightly longer than the thorax, dark green with aeneous tint; not strongly subcompressed.

*Male*.—Length 2 mm. Scape greenish brown, the flagellum very dark; legs entirely fuscous, except the coxae which are greenish. Abdomen depressed and shorter than the thorax.

*Type locality*.—Manitou, Colo.

*Host*.—*Disholcaspis rubens* Gillette on Scrub White Oak.

*Type*.—Cat. No. 25335, U.S.N.M.

Described from six females and one male. The type and three paratypes are recorded under Hopkins No. 13604c and were reared May 3 (type) to June 4, 1915, by W. Middleton. The male allotype and one paratype from the same locality and host are recorded under Hopkins No. 12089m and were reared April 1, 1915 from galls collected by A. B. Champlain. One female paratype, Hopkins No. 13604c, is in the author's collection.

72. *CALLIMOME MINUTISSIMUM*, new species

Figure 16

*Female*.—Length 2.25 mm.; ovipositor 2 mm. Green, the thorax brighter than the abdomen. Head as wide as thorax, the face finely sculptured; facial carina extending half the distance to mouth; scape yellow testaceous, flagellum brown, the first and second joints of funicle longer than wide, the others gradually growing wider toward the tip; antennal depression shallow, scarcely defined. Thorax bright green with a brassy reflection in some lights; minutely

punctate with a tendency to rugosity; parapsidal furrows and scutellar cross furrow distinct; the scutellar apex not so deeply sculptured and hence somewhat shining. Propodeum feebly reticulated and without a carina but with slight depressions on each side of the middle posteriorly; coxae dark green, femora and hind tibiae fuscous with a greenish tinge in some lights; tips of femora and tibiae dark testaceous; the tarsi yellowish; wings moderately ciliate; the marginal vein five-sixths as long as the submarginal; the stigmal vein more or less subsessile. Abdomen dark brownish green; segments medially emarginate.

*Male*.—Unknown.

*Type locality*.—Yosemite Park, Calif.

*Host*.—Twig gall on *Quercus*, species.

*Type*.—Cat. No. 25342, U.S.N.M.

Described from three females recorded under Hopkins No. 13341e, reared August 20, 1919, by J. E. Patterson. Two specimens are in the National collection; one paratype is in the author's collection.

### 73. CALLIMOME OCCIDENTALE, new species

#### Figure 32

*Female*.—Length 3.75 mm.; ovipositor 4.5 mm. Head not strongly transverse and scarcely as wide as the thorax; bluish green; facial carina low and broad and extending three-fifths the distance to margin of mouth; vertex finely reticulately rugose with some shallow impressions; the vertex roughly rectangular and more deeply reticulately rugose; antennal depression rather deep; ocelli light brown, prominent, the posterior ocelli about the diameter of one of them from the eye margin; eyes pinkish; scape below the middle of the face, dark green with slight brownish tints, the pedicel same color; ring-joint nearly rectangular, and combined with the pedicel longer than first funicle joint; joints of funicle gradually growing shorter toward the tip where they are almost rectangular. Thoracic dorsum minutely reticulately rugose, shallow impressions scarcely perceptible; clothed with pinkish-white hairs seen only in certain lights; scutellar cross furrow not deeply impressed; parapsidal furrows very deep; middle of scutellum with a longitudinal convexity and with a row of impressions on each side of it; scutellar apex strongly shining and with a bluish tint, slightly purplish in some lights; propodeum shining; coxae and femora brown with a tinge of blue, tibiae brown with bluish reflections, tarsi whitish with yellow tips; wings moderately ciliate, veins very pale yellow; the marginal vein about five-sevenths as long as submarginal, stigmal vein sessile. Abdomen dark green and two-sevenths longer than the thorax; segments somewhat medially emarginate and all but last one strongly incised; ovipositor longer than the body.



*Male*.—Length 2.25 mm. Similar to female but uniformly darker.

*Type locality*.—Hilt, Calif.

*Host*.—Dipterous galls on *Juniperus occidentalis* Hooker.

*Type*.—Cat. No. 25332, U.S.N.M.

Described from ten specimens as follows: Female type and four male paratypes recorded under Hopkins No. 12513c<sup>6</sup> were reared May 20, 1914, from material collected in the type locality by P. D. Sargent. Male allotype and three paratypes under Hopkins 12513c<sup>4</sup>, with same data. One specimen recorded under Hopkins No. 13342d was reared August 1, 1917, from galls on *Juniperus occidentalis* collected at Yosemite Park, Calif., by J. E. Patterson. Two specimens, bearing Hopkins Nos. 12513c<sup>4</sup> and 12513c<sup>6</sup>, are in the author's collection.

74. *CALLIMOME ALBITARSE*, new species

Figure 28

Most closely allied to *Callimome occidentale* Huber.

*Female*.—Length 3.5 mm.; ovipositor 3 mm. Thorax bright green, the abdomen darker green. Head as wide as thorax and about as long as wide; clypeus anteriorly produced and with two very noticeable incisions in the margin toward the center; face rather densely clothed with white appressed hairs; scape greenish-brown, somewhat testaceous at the base; flagellum brownish, the pedicel purplish-brown; ring-joint almost as long as wide and combined with the pedicel a little longer than the first joint of funicle; joints of funicle gradually growing shorter toward the tip, the last two slightly wider than long; the distance between the median ocellus and a posterior ocellus a little less than the distance between a posterior ocellus and the eye margin; eyes reddish, the ocelli amber. Thoracic dorsum uniformly minutely transversely reticulately rugose, there being no large shallow impressions; parapsidal furrows very indistinct; cross furrow on the scutellum well defined, the scutellar apex more finely rugose; scutellum roundly convex; propodeum polished but with a few shallow pits on the anterior margin; coxae and femora bluish-green; fore tibiae fuscous in the middle, the mid and hind tibiae also fuscous, the tips of the middle tibiae castaneous; wings moderately ciliate, veins yellow; the marginal vein three-fourths as long as submarginal and the stigmal vein sessile. Abdomen very much longer than the thorax; first three segments deeply incised dorsally, the fourth feebly incised; all segments uniformly dark green; ovipositor longer than abdomen.

*Male*.—Unknown.

*Type locality*.—Riley County, Kans.

*Host*.—Gall on *Solidago rigida* Linnaeus.

*Type*.—Cat. No. 25327, U.S.N.M.

Described from four females reared June to October by C. L. Marlatt. The types and two paratypes are in the National collection; one paratype is in the author's collection. For this species I have retained the manuscript name given it by Ashmead.

75. CALLIMOME WARRENI (Cockerell)

Figure 36

*Syntomaspis warreni* COCKERELL, Ent, News. vol. 20, 1911, p. 82.

Except for a few minor omissions and changes the original description of the female is as follows:

*Female*.—Length 4.3 mm.; ovipositor 5.4 mm. Bluish-purple with strong tints of crimson. Head transverse, peacock green with faint crimson tints, the frontal depressions behind the antennae shining golden; eyes bright terra cotta red; sides of face very minutely rugosopunctate, sides of front becoming striatulate; scape and ring-joint ferruginous, flagellum black, the joints of funicle minutely longitudinally keeled. Thoracic dorsum with large thimble-like punctures, variegated with green and crimson; posterior part of scutellum minutely granular, with microscopical punctures, and with a marginal sulcus crossed by fine ridges; scutellar cross furrow very prominent; anterior coxae brilliant green, the hind coxae crimson-purple; femora and tibiae bright chestnut red; tarsi yellowish, rufescent subapically, black at apex; lower margin of hind femora minutely denticulate beyond the middle; veins of wings fulvo-ferruginous, the stigmal vein sessile. Abdomen brilliant magenta, with purple shades; first three segments deeply incised medially and inclined to be carinate.

*Type locality*.—Trinidad, Colo.

*Host*.—(*Holcaspis*) *Disholcaspis*, species on *Quercus undulata* Torrey.

*Type*.—Cat. No. 13362, U.S.N.M.

*Male*.—Length 3.25 mm. Scape greenish-brown; joints of funicle longer than wide; femora bluish-purplish with crimson tints in some lights; fore tibiae infusate in middle, mid tibiae purplish, hind tibiae dark testaceous with a strong crimson-purplish tinge outwardly. Abdomen short and depressed.

Described from two males recorded under Hopkins, No. 13604c and reared by W. Middleton June 15, 1915, from *Disholcaspis rubens* Gillette on scrub white oak collected at Manitou, Colo.

*Distribution*.—Trinidad, Colo. (type). Manitou, Colo. (males described above). The following are also represented in the National collection: Two specimens, Hopkins No. 10773u, reared June 26, 1919, from *Disholcaspis rubens* Gillette on *Quercus gambelli* Nuttall, collected by J. H. Pollock at Colorado Springs, Colo. Two specimens, Hopkins No. 10781s, reared July 9 to August 7, 1919, from a twig gall on *Quercus oblongifolia* Torrey, collected by G. Hofer at Sycamore Flat, Ariz. One specimen, Hopkins No. 15604a, reared July 15 to August 17,

1918, from galls collected by L. H. Weld at Prescott, Ariz. Two specimens, Bureau of Entomology No. 2643<sup>01</sup>, reared June 30, 1882, from a Cynipid twig gall on *Quercus virginiana* Miller, collected by H. K. Morrison at Fort Grant, Ariz. Eight specimens, Hopkins No. 1378<sup>7</sup>, reared February 28, 1906, from a bud stem gall on *Quercus virginiana* Miller, collected by A. C. Morgan at Giddings, Tex. One specimen, Hopkins No. 13685<sup>a</sup>, reared June 1, 1918, from *Disholcaspis cinerosa* Bassett on *Quercus virginiana* Miller, collected by L. H. Weld at Wharton Tex. Two specimens, Hopkins No. 13686<sup>e</sup>, reared July 15, 1918, from *Disholcaspis spongiosa* Karsch, on *Quercus minor* Sargent, collected by L. H. Weld, presumably in Texas. In the author's collection there is one specimen bearing Hopkins No. 10781<sup>s</sup>.

76. CALLIMOME RACEMAREAE Ashmead

Figure 39

*Callimome racemareae* ASHMEAD, Trans. Amer. Ent. Soc., vol. 9, 1881, Proc., p. xxxiii.

*Syntomaspis racemareae* (Ashmead) ASHMEAD, Trans. Amer. Ent. Soc., vol. 14, 1887, p. 187.

*Female*.—Length 5 mm.; ovipositor 11 mm. Dark bluish-purple, shining in reflected light. Head transverse, wide as thorax and two-thirds as long as wide; face iridescent bluish-purple with a tint of green, the lower half most densely clothed with whitish pile; facial carina prominent and extending one-half the distance to margin of mouth; scape ferruginous to yellow and scarcely attaining the posterior ocellus which is located at the apex of antennal depression; pedicel ferruginous, rest of antennae black; scape, ring-joint, and pedicel equal to first three joints of funicle; joints of funicle all distinctly longer than wide and of equal width. Thorax with a crimson-purplish tinge ventrally; dorsum clothed with rather long semirecumbent whitish hairs and very coarsely and irregularly punctate, the space between the punctures being rugose and shining; scutellum not so deeply punctured as the mesoscutum and slightly depressed medially; scutellar apex striolate reticulate and without large punctures or hairs; parapsidal furrows distinct, the cross furrow on the scutellum well defined; propodeum carinated and with very large ridges and pits on anterior; coxae crimson-purplish with tinge of green in some light; femora and tibiae castaneous, tarsi whitish the last two joints brown; hind femora with very minute denticulations on the lower margin beyond the middle and clothed sparsely with long white hairs; wings moderately ciliate, veins brown; the submarginal vein not quite twice as long as the marginal, the stigmal vein sessile. Abdomen distinctly shorter than the thorax; posterior margins of tergites purplish, the anterior margins green; first four segments feebly carinated and deeply incised medially.

*Male*.—Length 3.75 mm. Body mostly green but cyanescent. First joint of funicle about four times as long as the pedicel and ring-joint combined; front and middle coxae brownish, the hind coxae brown at tips; femora greenish-purple, fuscous in some lights, the hind ones darkest; tibiae light brown on the outside with a crimson-green tint in some lights. Abdomen shining green and depressed.

*Type locality*.—Jacksonville, Fla.

*Host*.—*Amphibolips racemaria* Ashmead.

*Type*.—Cat. No. 2824, U.S.N.M.

This species is represented in the National collection by the single female type which I have redescribed above. The allotype male has apparently been lost. The above description of the male is based on a specimen reared September 1, 1920, from *Disholcaspis terrestris* Weld on *Quercus margaretta* Ashe collected by L. H. Weld at Ocala, Fla., and recorded under Hopkins U. S. No. 15634a.

The color tints of this species vary considerably, depending to a great extent upon the light. In color it is very similar to *Callimome cinerosum* Huber; however, it is readily separated from this species by the difference in the sculpture of the propodeum and the thoracic dorsum.

*Distribution*.—Jacksonville, Fla. (Type). The following specimens are in the United States National Museum: Three specimens, Hopkins No. 15634a, reared September 1, 1920, from *Disholcaspis terrestris* on *Quercus margaretta* Ashe, collected by L. H. Weld at Ocala, Fla. One specimen reared from *Amphibolips fuliginosa* Ashmead collected at Tallahassee, Fla., and bearing No. 1175. Two specimens, Hopkins No. 15632b reared June 3, 1920, from *Amphibolips prunus* Walsh on *Quercus*, species, collected by L. H. Weld in Alabama and Florida. Seven specimens, Hopkins No. 15632a, reared September 1, 1920, from *Disholcaspis fasciata* Bassett on *Quercus*, species, collected by L. H. Weld in Alabama and Florida. Two specimens, Hopkins No. 13686b, reared August 15, 1918, from *Amphibolips ginesi* Bassett, on *Quercus schneckii* Britton, collected by L. H. Weld at Boerne, Tex. Three specimens, Hopkins No. 13685a, reared August 1 to September 6, 1918, from *Disholcaspis cinerosa* Bassett on *Quercus virginiana* Miller, collected by L. H. Weld at Wharton, Tex. One specimen reared from *Amphibolips q-prunus* Walsh on *Quercus margaretta* Ashe, Fla. Two specimens, Hopkins No. 12072, reared June 29, 1914, from *Amphibolips q-inanis* Osten Sacken on *Quercus rubra* Linnaeus collected by W. Middleton at Plummer Island, Md. Three specimens from New Brunswick, N. J., and one specimen from Waterbury, Conn., which bear no additional data. Two specimens, Hopkins No. 12039, reared May 26, 1914, from *Disholcaspis rugosa* Bassett on *Quercus minor* Sargent (*Quercus stellata* Wangenheim) collected by W. Middleton at Falls Church, Va. One specimen, Hopkins No. 12039, reared

July 29, 1914, from *Disholcaspis rugosa* (Bassett) on *Quercus alba* Linnaeus collected by S. A. Rohwer at Falls Church, Va. Two specimens, Hopkins No. 13685e, reared February 26, 1918, and January 15, 1919, from *Disholcaspis globulus* Fitch on *Quercus alba* Linnaeus collected by W. Middleton at Falls Church, Va. Four specimens, Hopkins No. 12070s reared May 20 to July 29, 1914, from *Disholcaspis globulus* (Fitch) on *Quercus alba* Linnaeus collected by W. Middleton at Falls Church, Va. In the author's collection there is one specimen labeled November 22, 1919, reared from *Amphibolips gainesi* Bassett collected by A. L. Kinsey at Hearne, Tex.; and one specimen from the Thompson collection reared from *Amphibolips confluentis* Harris, R. I.

77. *CALLIMOME CINEROSUM*, new species

Similar to Figure 40

Closely allied to *Callimome racemareae* (Ashmead), from which it differs by having no carina, by having very small pits on the propodeum, and a differently sculptured scutellar apex.

*Female*.—Length 5.25 mm.; ovipositor 8.5 mm. Uniform indigo-blue tinged with green in some lights. Head wider than long, viewed from front densely clothed with long, appressed, white hairs below the antennae; facial carina reaching three-fourths the distance to the margin of the mouth and transversely minutely aciculated; scape testaceous, flagellum black; pedicel short, robust, not half as long as first funicle joint; ring-joint about four times as wide as long; all joints of funicle longer than wide and of equal width, and clothed with very closely set short hairs; ocelli amber, eyes red; the ocellular line one and one-half times the diameter of posterior ocellus, and the lateral ocellar line about as long as the diameter of an ocellus. Thoracic dorsum with large umbilicate punctures; mesoscutum robust through the central part, the parapsidal furrows deep; space between the large punctures finely reticulated; scutellum wide, rather flat and not so deeply and thickly sculptured as the mesoscutum; scutellar cross furrow deep, the apex finely reticulated; propodeum rather moderately sculptured, with small pits on the anterior margin and without a carina; fore coxae brownish-blue, mid coxae indigote with a tinge of blue and green, the hind coxae indigote with a purplish tint; femora and tibiae dark testaceous, the hind femora minutely denticulate on the lower margin and somewhat swollen; tarsi yellow ferruginous; stigmal vein sessile. Abdomen purplish-blue with greenish tints in some lights; first four segments weakly carinate and medially incised.

*Male*.—Unknown.

*Type locality*.—Victoria, Tex.

*Host*.—*Disholcaspis cinerosa* Bassett on *Quercus virginiana* Miller.

*Type*.—Cat. No. 25322, U.S.N.M.

This species is described from one female type and four female paratypes. The National collection contains three specimens, including the type, Hopkins No. 13687a, reared from *Disholcaspis cinerosa* Bassett on *Quercus virginiana* Miller, April 5, 1918, collected by J. D. Mitchell, at Victoria, Tex.; and one specimen reared March 15, 1911, from *Amphibolips*, species on *Quercus virginiana* Miller, collected by J. D. Mitchell at Victoria, Tex. In the author's collection is one specimen bearing Hopkins No. 13687a and other data for this number as given above.

78. CALLIMOME CALIFORNICUM, variety SUBDOLUM, new variety

Similar to Figure 41

This variety is very closely related to *Callimome californicum* Ashmead and may easily be mistaken for it; characters indicated in the key with those mentioned below will help to separate the variety.

*Female*.—Length 3.5 mm.; ovipositor 3.5 mm. Thorax green with a golden tint in some lights. Head viewed from the front coppery green, coarsely reticulately punctate and clothed moderately with white hairs; facial carina low but very wide and extending to margin of clypeus; antennal depression almost as deep as the diameter of the scape and cupreous within; scape testaceous, the flagellum brown, the pedicel and ring-joint darker and together as long as first funicle joint which is about one-fifth longer than wide and not more than four-fifths as long as the second joint; all joints of funicle longer than wide, of about equal width and clothed with closely set brownish hairs; ocelli maroon, eyes red; the ocellocular line about one and two-fifths times as long as the lateral ocellar line; the diameter of the median ocellus one-third longer than the lateral ocellar line and about four-fifths as wide as the ocellocular line. Thoracic dorsum deeply punctured; pronotum and anterior of mesoscutum coarsely rugose, the large thimble-like punctures not apparent; mesoscutum one-third longer than the scutellum and conspicuously rugose between the large punctures; punctures not so numerous as on the mesoscutum, the anterior one-third mostly finely reticulated, the remaining portion as far as the scutellar cross furrow reticulated between the large punctures; scutellar apex finely sculptured and occupying one-third of the scutellar area; propodeum feebly rugose, smooth, green, the anterior margin with small pits; coxae greenish-brown, the hind ones coppery; femora brown testaceous with a greenish tinge, the hind ones very slightly enlarged; tibiae dark testaceous, the tip of hind ones brown testaceous; tarsi whitish-yellow; veins brownish; marginal vein not quite three-fifths as long as the submarginal; the stigmal vein sessile but with a rather long uncus; vein radiating toward the tip of wing and upward from the stigmal vein consisting of a single row of hairs.

Abdomen about half as long as the thorax and fuscous with a cupreous tinge.

*Male*.—Length 2 mm. Bluish-green with no brassy reflection. Scape dark testaceous with a tinge of brownish-green; flagellum fuscous all joints of funicle longer than wide; coxae and femora dark green; tibiae fuscous with a testaceous or greenish shades.

*Type locality*.—Camp Baldy, Calif.

*Host*.—*Disholcaspis truckeensis* Ashmead on *Quercus chrysolepis* Liebmann.

*Type*.—Cat. No. 25343, U.S.N.M.

Described from many specimens. The type series, except for two paratypes bearing Hopkins No. 15613*b* in the author's collection, is in the National collection.

*Distribution*.—Twelve females (one type) and 20 males (one allotype), Hopkins No. 15613*b*, reared from *Disholcaspis truckeensis* Ashmead on *Quercus chrysolepis* Liebmann, June 24 to August 8, 1918, collected at Camp Baldy, Calif., by L. H. Weld. Other paratypes as follows: Two specimens, Hopkins No. 15613*e*, reared July 8, 1918, from *Disholcaspis chrysolepidis* Beutenmueller on *Quercus chrysolepis* Liebmann, collected at Los Gatos Calif., by L. H. Weld. One specimen, Hopkins No. 15922*h*, reared July 9, 1919, from *Disholcaspis truckeensis* Ashmead on *Quercus chrysolepis* Liebmann, collected by R. D. Hartman at Los Gatos, Calif. Two specimens reared, May 6, 1917, from *Disholcaspis corallina* (Bassett), collected at Tuolumne, Calif.

#### 79. CALLIMOME MACULIPENNE (Cameron)

*Syntomaspis maculipennis* CAMERON, Biol. Centr. Amer., p. 31, 1884, Hymen, vol. 1, p. 107, No. 1.

With the exception of a few minor changes in arrangement the original description is as follows:

*Female*.—Length 4.5 mm; ovipositor as long as the body. Head and thorax (except the pleurae behind, where they are smooth, shining, impunctate, and of a bluish tint) strongly and closely punctured. Front excavated above the antennae in the middle; the face coppery. Antennae rather slender, the flagellum getting thicker toward the apex; the third joint longer than the fourth, the apical compressed. Scape thin, cylindrical, reaching to the lower ocellus. Annelus long, longer than broad, thicker and rounded at the apex. Scutellum behind the transverse line much finer and closer punctured than it is in front of it. Coxae rather strongly, femora obscurely punctured. The coxae are coppery; femora black, with a slight coppery tint. The posterior tibiae are black except at base and apex; the anterior are for the greater part testaceous in front, coppery behind. The tarsi are of a clear yellow except that the apices of the joints of the posterior tarsi are fuscous; the long spur of the calcaria reaches a

little beyond the middle. Wings clearly hyaline; humerus testaceous; ulna and cubitus blackish, on the latter a fuscous fascia. Abdomen smooth, shining, coppery. The posterior edge of basal segment of abdomen incised. As with most of the species the coppery tints are irregularly distributed over the body.

*Type locality*.—Mexico.

*Host*.—Reared from a gall.

This species is unrecognized by the writer. It is quite evident, however, that it is closely allied to *Callimome californicum* (Ashmead). Type probably in the British Museum of Natural History.

#### 80. *CALLIMOME CALIFORNICUM* (Ashmead)

Similar to Figure 41

*Syntomaspis californica* ASHMEAD, Trans. Amer. Ent. Soc., vol. 13, 1886, p. 127, No. 26.

*Syntomaspis californica* Ashmead (?) FULLAWAY, Journ. N. Y. Ent. Soc., vol. 20, 1912, p. 274.

*Female*.—Length 4 mm; ovipositor 6.75 mm. Thoracic dorsum golden green and with large thimblelike punctures. Head strongly transverse and as wide as thorax; viewed from the front rather coarsely rugosely sculptured and with numerous shallow irregularly placed impressions; face with golden coppery tints in some lights and rather densely clothed with moderately long white appressed hairs; facial carina low and broad, extending to margin of mouth; scape pale testaceous, flagellum brown; pedicel and ring-joint together about two-thirds as long as first joint of funicle; first funicle joint and ring-joint combined about as long as second funicle joint; all funicle joints distinctly longer than wide and of equal width; the ocellocular line about one and one-fifth times the length of the long diameter of posterior ocellus; eyes red. Area between the large discoidal punctures of thoracic dorsum coarsely rugose; punctures on the scutellum not so numerous but larger than on the mesoscutum and the area between them reticulated; scutellar cross furrow deep, the area behind it finely reticulately rugose and occupying one-third of the entire scutellum; propodeum feebly rugose, smooth, with a row of small pits on the anterior margin; coxae green, the hind one strongly cupreous outwardly above; femora and tibiae moderately testaceous, the hind femora distinctly bulged on the lower margin beyond the middle and with several minute denticulations; tarsi yellowish, the last joint brown; veins of wings yellowish; the marginal vein a little over one-half as long as the submarginal; the vein running from the stigmal vein toward the tip and upward consisting of a single row of hairs; stigmal vein sessile. Abdomen slightly subcompressed and somewhat carinate; the first three segments medially incised; conspicuously but feebly reticulated.



*Male*.—Length 3.5 mm. More uniform green than the female. Thoracic dorsum rather densely clothed with silvery hairs; all femora green, the proportion of green increasing from the fore to the hind femora; the tips not green; tibiae light brown to chestnut; flagellum dense black; first joint of funicle a little more than twice as long as pedicel and ring joint combined. Abdomen green.

*Type locality*.—California.

*Host*.—*Andricus pomiformis* (Bassett) Ashmead.

*Type*.—Cat. No. 25316, U.S.N.M.

I have redescribed this species from the type series in the National collection, which consists of one female type, one male allotype, and one male paratype. It resembles the variety *subdolum* Huber in general sculpture and form, but may be separated by its larger body, an ovipositor at least one and one-half times as long as the body, and a distinctly golden-green color.

*Distribution*.—California (type). Besides the type series the following are in the National collection: Six specimens, Hopkins No. 5605a, reared May 29, 1918, from *Andricus pomiformis* Bassett on *Quercus wislizenii* De Candolle, collected by L. H. Weld at Upland, Calif. Eight specimens, Hopkins No. 5605eb, reared November 6, 1918, from *Andricus pomiformis* Bassett on *Quercus wislizenii* De Candolle, collected by L. H. Weld at Camp Baldy, Calif. Five specimens, Hopkins No. 15605e, reared July 15, 1918, from *Callirhytis rossi* Kieffer on *Quercus wislizenii* De Candolle, collected by L. H. Weld at Camp Baldy, Calif. Five specimens, Hopkins No. 19922f, reared August 7, 1919; from *Callirhytis*, species on *Quercus chrysolepis* Liebmann, collected by R. D. Hartman at Los Gatos, Calif. Seven specimens, Hopkins No. 19922h, reared June 4 to June 26, 1919, from *Disholcaspis truckeensis* Ashmead on *Quercus chrysolepis* Liebmann, collected by R. D. Hartman at Los Gatos, Calif. One specimen, Hopkins No. 13643j, reared November 14, 1916, from *Disholcaspis* species on *Quercus douglasi* Hooker and Arnott, collected by F. R. Herbert at Placerville, Calif. One specimen, Hopkins No. 15613b, reared August 1, 1918, from *Disholcaspis truckeensis* Ashmead on *Quercus chrysolepis* Liebmann, collected by L. H. Weld at Camp Baldy, Calif. Seventeen specimens No. 3833Q1 and three specimens No. 3833½ reared from twig galls on *Quercus wislizenii* De Candolle collected by A. Koebele at Marion County, Calif. Three specimens No. 549 reared October, 1889, from galls on *Quercus dumosa* Nuttall, collected by A. Koebele in Sonoma County, Calif. Eight specimens, Hopkins No. 14215, reared July 29, 1916, from *Disholcaspis maculipennis* Gillette on *Quercus garryana* Douglas, collected by J. M. Miller at Ashland, Oreg. Three specimens, Hopkins No. 12595b², reared August 9, 1915, from *Disholcaspis maculipennis* Gillette

on *Quercus garryana* Douglas, collected by J. M. Miller at Ashland, Oreg. Three specimens, Hopkins No. 12595f<sup>2</sup>, reared February 26, 1915, from *Disholcaspis maculipennis* Gillette on *Quercus garryana* Douglas, collected by J. M. Miller at Ashland, Oreg. Six specimens, Hopkins No. 47a with no data. Twenty-four specimens, No. 22° Sacramento, reared August and September from Cynipid galls on *Quercus wislizenii* De Candolle at Folsom, Calif.

In author's collection are several specimens reared from galls collected by A. C. Kinsey. The dates given refer to the time the galls were collected and not to when the Chalcids emerged. One specimen reared from *Andricus pomiformis* Bassett on *Quercus wislizenii* De Candolle, Three Rivers, Calif., March 23, 1920. Three specimens reared from *Andricus pacificus* Ashmead on *Quercus chrysolepis* Liebmann, El Portal, Calif., March 26, 1920. Three specimens reared from *Disholcaspis corallina* (Bassett) on *Quercus douglasi* Hooker and Arnott, Byron, Calif., March 19, 1920. One specimen reared from *Disholcaspis plumbella* Kinsey on *Quercus dumosa* Nuttall, S. Jacinto Mountains, Calif., February 28, 1920, and one specimen of *Disholcaspis simulata* Kinsey with the same data. Four specimens reared from *Disholcaspis maculipennis* Gillette on *Quercus garryana* Douglas, Yreka, Calif., April 4, 1920, and two specimens from Ashland, Oreg., with same data. One specimen reared from *Andricus californicus-glabrescens* Kinsey on *Quercus dumosa* Nuttall, El Toro, Calif., February 14, 1920. Four specimens reared from *Andricus californicus* (Bassett) on *Quercus dumosa* Nuttall, Alpine, Calif., February 24, 1920. Two specimens reared from *Andricus californicus californicus* Kinsey on *Quercus douglasi* Hooper and Arnott, Gilroy, Calif., March 19, 1920. Two specimens reared from *Andricus californicus californicus* Kinsey on *Quercus lobata* Nees, Paso Robles, Calif., March 7, 1920. One specimen *Disholcaspis maculipennis* Gillette on *Quercus garryana* Douglas, Ashland, Oreg., April 4, 1920.

The variation in this species is quite apparent. In specimens reared from the same gall the ovipositor may be proportionately one-third longer than normal. Color varies from a golden-green to a decided coppery. And as in most species the size varies apparently according to the food supply.

#### 81. CALLIMOME ELEGANTISSIMUM Ashmead

Figure 41

*Callimome elegantissima* ASHMEAD, Trans. Amer. Ent. Soc., vol. 9, 1881, Proc. p., xxxiv.

*Syntomaspis elegantissima* (Ashmead) ASHMEAD, Trans. Amer. Ent. Soc., vol. 14, 1887, p. 187.

*Female*.—Length 4.5 mm.; ovipositor 5.25 mm. Thoracic dorsum coarsely punctured and very distinctly cupreous. Head transverse

and as wide as thorax; face mostly minutely reticulately rugose, with a few large but shallow impressions, and clothed sparsely with whitish hairs; facial carina low and very wide, extending nearly to the margin of the mouth, becoming wider toward the tip and with its sides well defined with depressed lines; face rather copperish in some lights; scape dark testaceous, flagellum blackish; pedicel robust and brownish; ring-joint and pedicel combined about three-fourths as long as the first joint of funicle which is subequal to the second, the other joints gradually decreasing in length toward the tip but all decidedly longer than wide and of equal width; the ocellocular line one and one-fourth times as long as the diameter of median ocellus; the lateral ocellar line shorter than the diameter of mid ocellus and the same length as the line between the foraminal margin and the posterior ocellus. Pronotum very short, transversely rugose with moderate-sized impressions; the posterior margin bluish; anterior margin of the mesoscutum rather finely transversely rugose and greenish, the rest of the mesoscutum and the inner and dorsal margins of scapulae and axillae and the scutellum back to the cross furrow, very strongly cupreous; space between the large punctures highly rugose; scutellar cross furrow deep, the scutellar apex one-fourth as long as the entire scutellum and finely reticulately rugose, not so highly tinged as rest of scutellum; propodeum feebly longitudinally rugose, smooth, greenish-blue, and anterior margin with a row of moderate-sized pits; coxae green with a bluish-purple tint in some lights; femora and tibiae dark testaceous, the hind femora not conspicuously bulged on the lower margin beyond the middle and with no minute denticulations; tarsi pale ferruginous, the tips brown; mesopleura purplish; veins of wings yellow, marginal vein a little more than one-half as long as submarginal; stigmal vein sessile and with a vein consisting of a double row of hairs running from it upward and toward the tip. Abdomen as long as the thorax and seen from above as wide as the thorax; green with a purplish tinge; first four segments medially incised.

*Male*.—Length 2.25 mm. Body mostly green, the thoracic dorsum with a rusty tinge. Scape brown testaceous, flagellum blackish; femora dark green, tibiae dark testaceous, the hind ones growing blackish toward the tip.

*Type locality*.—Jacksonville, Fla.

*Host*.—*Cynips q-ficus* Fitch.

*Type*.—Cat. No. 25315, U.S.N.M.

The National collection contains one well-preserved type specimen from which I have redescribed the female. The male is described for the first time from a specimen bearing the following data: Hopkins No.15633c reared November 23, 1920, from *Disholcaspis ficigera*

Ashmead on *Quercus geminata* Small, collected by L. H. Weld, Carabelle, Fla. A female with the same data is in the author's collection.

This species is most closely related to *Callimome californicum* (Ashmead) but can be easily separated from it by the characters given in the key.

82. *CALLIMOME PRUNICOLA*, new species

Figure 17

*Female*.—Length 2.25 mm.; ovipositor 0.5 mm. Purplish-crimson; head wider than thorax and with coarse but shallow punctures; sparsely clothed with white hairs; facial carina extending half the distance to margin of mouth; scape yellow, pedicel brown with a purplish shade, flagellum brown; ring-joint one and one-half times as wide as long, the pedicel as long as first joint of funicle which is longer than wide; the succeeding joints of funicle as wide to wider than long toward the tip; eyes brunneus. Thorax robust, dorsum a brilliant crimson purple, the sculpture coarsely rugose; sides of pronotum prominent; mesoscutum as long as the width of front margin; parapsidal furrows deep, the scapulae bulged; scutellum as long as the mesoscutum, the scutellar cross furrow distinct and back of the apical one-third; scutellar apex minutely striate and greenish in some lights; propodeum shining but with carinae in the middle; coxae and femora crimson purplish, tibiae lighter but with a decided crimson tinge; tarsi whitish yellow, stigmal vein sessile. Abdomen ovate, robust; segments not incised; sides with long silvery hairs especially on the posterior segments; ovipositor one-third as long as abdomen and very erect.

*Male*.—Unknown.

*Type locality*.—Sante Fe, New Mexico.

*Host*.—"On cherry."

*Type*.—Cat. No. 25328, U.S.N.M.

This species is described from one female collected by T. D. A. Cockerell and is recorded under Cockerell No. 1102, and bears a note that it was taken on cherry.

83. *CALLIMOME HOLCASPOIDEA* (Ashmead)

Figure 5

*Syntomaspis holcaspoidea* ASHMEAD, Mem. Car. Mus., vol. 1, 1904, p. 397.

Redescribed from two females in the National collection and labeled as *holcaspoidea*.

*Female*.—Length 2 mm.; ovipositor as long as abdomen. Blue with a tinge of crimson. Face rather coarsely rugulose, bulging below the antennal depression, tinged with green and clothed with short white hairs; facial carina very poorly developed, extending scarcely outside of scrobes; scrobes deep and bright green; vertex coarsely sculptured; scape yellow, pedicel light brown, the remainder of antennae slightly darker and distinctly clubbed; eyes pinkish, the

ocelli transparent. Thorax coarsely rugose-punctate and with a violaceous tinge in some lights; pronotum not so coarsely sculptured as the mesoscutum and margined posteriorly with a shining band; cross furrow on the scutellum deeply impressed; scutellar apex finely reticulate and with a bluish metallic color; pleura violaceous; coxae violaceous blue, trochanters light brown, femora light brown on the inside and crimson-brown on the outside; tibiae yellowish, tarsi mostly whitish-yellow; stigmal vein sessile. Abdomen a little shorter than the thorax, violaceous blue, segments emarginate dorsally.

*Male*.—Length 1.2 to 1.5 mm. Agrees well with the female in color and sculpture, except that the scape of the antennae alone is yellowish, the pedicel being aeneous-black. The abdomen is small, oval. Ashmead.

*Type locality*.—Chapada and Corumbá, Brazil.

*Host*.—Unknown.

*Types*.—Two males and two females in Carnegie Museum.

The females from which the above redescription is drawn were taken in Benito Province, Pernambuco, Brazil, February, 1883. Although I have not had opportunity to study the types I believe that the specimens in the National collection are identical with them.

#### 84. *CALLIMOME SOLIDAGINIS*, new species

##### Figure 6

Resembles *Callimome holcaspoidea* (Ashmead) but may be separated by the characters indicated in the key.

*Female*.—Length 2 mm; ovipositor 1.5 mm. Bluish purple with tinge of violet. Head transverse; viewed from the front slightly wider than long; face minutely sculptured, with a few short but stout white hairs, slightly convex and with a brownish-green tinge; vertex strongly convex; ocelli amber, the eyes reddish; width between the posterior ocellus and the eye margin about one and one-half times the diameter of an ocellus; scape yellow, pedicel very fuscous, the rest of the flagellum not so dark; flagellum distinctly clubbed and longer than the width of the head. Thoracic dorsum with large umbilicate punctures which become more shallow towards the posterior, the scutellum with very few punctures but with a very fine reticulated sculpture; scutellar cross furrow well defined, the scutellar apex entirely reticulated; parapsidal grooves and other thoracic grooves strongly impressed and with greenish margins; coxae, trochanters and femora brown with violaceous tinges, especially on the hind femora, which in certain lights appears violaceous; tibiae distinctly ciliate, the stigmal vein sessile. Abdomen brown, slightly violaceous in certain lights; segments medially emarginate; ovipositor brown.

*Male*.—Length 1.6 mm. Scape purplish-green, pleura purplish, femora brownish-purple except tips of mid and fore tibiae. Abdomen shorter than thorax and brownish purple.

*Type locality*.—Ithaca, N. Y.

*Host*.—*Cecidomyia*, species.

*Type*.—Cat. No. 25325, U.S.N.M.

Described from two females and one male reared February 28, 1898. The female type and male allotype are in the National collection; one female paratype is in the author's collection.

85. CALLIMOME OSBORN, new species

Figure 4

*Female*.—Length 2.75 mm.; ovipositor 3.75 mm. Thorax bluish-green and deeply punctured; abdomen mostly yellow. Head very much wider than the thorax and not strongly transverse; blue-green except the margin of the mouth which is brown; facial carina scarcely noticeable; scape attached to middle of the head, light yellow, rather robust and slightly curved; pedicel a little darker than the scape and somewhat brownish; rest of flagellum brown; pedicel and ring-joint combined equal to the first joint of funicle which is five-eighths as wide as the last joint of funicle; eyes and ocelli brunneus, the latter almost in a straight line; the posterior ocelli about one and one-half times their diameter from the eye margin. Pronotum almost entirely transversely rugose, the mesoscutum with deep thimble-like punctures but with a very coarse rugosity between the pits; parapsidal grooves very distinct and not parallel at any point; scutellum not so deeply sculptured, minutely reticulated anteriorly; scutellar cross furrow distinct, the apex feebly sculptured and vertically rugose; propodeum with a median carina, the anterior margin deeply pitted; pleura purplish; coxae brown with a blue green tinge, the tips yellowish; femora, except the hind ones which are brown on the basal half, yellow; tibiae yellow-ferruginous; wings moderately ciliate, veins brown, the stigmal vein sessile. Abdomen a little longer than the thorax; brownish ventrally, yellow laterally and dorsally, except a brown area beginning one-third the distance from the anterior and extending back to the ovipositor and about one-third the width of abdomen; ovipositor three times as long as abdomen.

*Male*.—Joints of funicle all distinctly longer than wide and of equal width; hind tibiae brown, the others yellow-ferruginous with tints of brown. Abdomen without yellow color but greenish-blue.

*Type locality*.—Point of Rocks, Wyo.

*Host*.—Cynipid gall on *Rosa*, species.

*Type*.—Cat. No. 25323, U.S.N.M.

Describe from one female and two males reared May, 1882, by L. Bruner and recorded under No. 1010c. The female type and male allotype are in the National collection. One paratype is in the author's collection. I have named this species in honor of Prof. Herbert Osborn.

86. *CALLIMOME UMBILICATUM* (Gahan)

Figure 3

*Syntomaspis umbilicata* GAHAN, Ann. Ent. Soc. Amer., vol. 12, 1919, pp. 163-4.

With the exception of a few minor changes the original description is as follows:

*Female*.—Length 2.5 mm.; ovipositor about as long as body. Head viewed from front above as long as broad; face strongly sculptured with large shallow punctures; antennal depressions deep and nearly smooth within, the antennae separated at the base by a carinate ridge; post ocellar line equal to twice the ocellocular line, the lateral ocelli not farther from the eye margin than the diameter of an ocellus; antennal pedicel conical, about equal in length to the first funicle joint; ring-joint a little more than twice as broad as long; first funicle joint nearly quadrate, following joints diminishing very gradually in length, the last about two-thirds as long as broad; club three-jointed, not broader than the funicle and about as long as the three preceding funicle joints; pronotum rugulose; mesoscutum with large, closely placed umbilicate punctures surface of the scutellum before the distinct cross-furrow sculptured like the mesoscutum, behind the cross-furrow finely reticulately sculptured; propodeum polished, with carinae and with a row of large punctures along the anterior margin; ciliation of the forewing similar to that described for *Callimome* (*Syntomaspis*) *medicaginis* (Gahan), but not so distinctly arranged in rows, the row running from the stigmal vein to apex of wings present, but very poorly defined and the wedge shaped hairless area behind the marginal vein somewhat more restricted, there being three or four coarse cilia basad of the stigmal vein in the apex of the wedge; marginal vein four-fifths as long as submarginal; hind coxae about twice as long as thick with the dorso posterior angle weakly carinately margined; abdomen about as long as the thorax; first, second, and third tergites emarginate medially, dorsally mostly polished; the second and third at sides, and the fourth entirely, distinctly reticulate; color of head and thorax above dull coppery green; propodeum polished metallic green; pleurae, coxae and all femora metallic greenish-black or bluish in some lights; first three tergites above steel-blue sides of the abdomen and dorsum beyond the third tergite brassy green; antennal pedicel and flagellum brownish-black, more or less metallic; scape, all tibiae, and tarsi reddish testaceous; ovipositor sheaths black; wings hyaline; venation pale yellowish.

*Male*.—Length 2 mm. Antennal pedicel a little shorter than the first funicle joint; first funicle joint slightly broader than long and not longer than the second; joints beyond the second very slightly diminishing in length; propodeum faintly rugulose with a very weak

median carina; abdomen a little shorter than thorax; scape dark above, reddish testaceous beneath; all tibiae brownish-black; tarsi pale yellowish.

*Type locality*.—Tempe, Ariz.

*Host*.—Gall of a Cecidomyid on *Suaeda*, species.

*Type*.—Cat. No. 22298, U.S.N.M.

The type series in the National collection consist of a female type, a male allotype, and two male paratypes reared by V. L. Wildermuth and recorded under Tempe No. 2741.

*Distribution*.—Tempe, Ariz. (Type). There are also in the National collection 11 specimens No. 229° reared June, 1887, from Cecidomyid galls on *Atriplex canescens* (Pursh) Watson, collected by A. Koebele at Los Angeles County, Calif.; two specimens of this same series are in the author's collection.

#### 87. CALLIMOME RUGOSIPUNCTATUM (Ashmead)

##### Figure 25

*Torymus rugosipunctatus* ASHMEAD, Journ. Linn. Soc. Lond. Zool., vol. 25, 1894, p. 193.

*Female*.—Length 2 mm.; ovipositor 2 mm. Slightly brassy green with deep umbilicate punctures. Head transverse and rather deeply punctured; viewed from the front almost as long as wide, distinctly wider than the thorax, and with a brassy tinge in some lights; a row of coppery pits on the eye margins, and very sparsely clothed with hairs; facial carina extending three-fifths the distance to margin of mouth, which is brownish; antennae inserted in middle of head, the antennal depression prominent and smooth within; scape yellowish, pedicel dark testaceous, the rest of flagellum brown and distinctly clubbed; pedicel and ring-joint much longer than the first joint of funicle the ring-joint as wide as long; the funicle and club densely pubescent; ocelli and eyes red. Thoracic dorsum deeply and irregularly sculptured with large thimble-like pits, the scutellar apex not punctured but with microscopic striae and hence shining; metanotum as long as propodeum; propodeum with a carina; coxae greenish-brown, femora fuscous, the tips a little lighted; tibiae reddish testaceous, the tarsi testaceous except the last joint which is brown; veins of wings yellow; marginal and submarginal veins equal in length, the stigmal vein sessile. Abdomen dark green, shorter than the thorax, strongly subcompressed, and carinate above.

*Male*.—Length 1.75 mm. Scape testaceous; femora light brown with a greenish tinge, hind tibiae infuscated the other tibiae testaceous.

*Type locality*.—St. Vincent, West Indies.

*Host*.—Unknown.

*Type*.—Cat. No. 2434, U.S.N.M.



This species was described by Ashmead from 8 males and 12 females; of that series one female type and one male allotype are in the National collection. I have redescribed the species from these specimens. In addition to the above data they are labeled H. H. Smith, 207.

88. *CALLIMOME TRICOLOR*, new species

Figure 27

Resembles *Callimome advena* Osten Sacken in general size and structure but may be separated from it by the characters indicated in the key.

*Female*.—Length 2.5 mm.; ovipositor 2.5 mm. Head and thorax greenish-blue, the abdomen purplish to crimson. Head distinctly broader than thorax; face strongly punctured with large shallow impressions and sparsely clothed with short white hairs; scrobes deep and blue within; facial carina prominent; post ocellar line equal to twice the ocell-ocular line, the posterior ocelli a little more than their diameter from the eye margin; eyes red. Prothorax rugulose, the rest of thoracic dorsum deeply punctured with large thimble-like punctures, except behind the well-marked scutellar cross furrow; the scutellar apex finely reticulately rugose and with a shining golden green reflection; metanotum with a median carina, the propodeum polished and also with a median carina and several large pits on the anterior margin; coxae blue-green, purplish in some lights, the hind ones somewhat crimson, the upper margin sharply carinate, the lower side longitudinally rugose and bright green; femora all dark, the first pair rather brown, the second and third dark brown with a bluish-green tinge, except the extreme tips which are castaneous; all tibiae reddish testaceous, the last joint of tarsi brown; wings moderately ciliate; the submarginal vein one and one-seventh times as long as the marginal, the stigmal vein sessile. Abdomen bluish crimson with green tint in some lights; distinctly longer than the thorax, somewhat subcompressed, the first four segments incised slightly medially.

*Male*.—Length 2 mm. Scape flavo-testaceous; hind femora dark blue-green, the other femora and hind tibiae deeply infuscated, the mid and fore tibiae brownish-yellow. Abdomen with a violaceous tinge.

*Type locality*.—Brownsville, Tex.

*Host*.—*Asphondylia*, species.

*Type*.—Cat. No. 25326, U.S.N.M.

Described from 10 females and 7 males reared July 3 to 11, 1912, and recorded under Webster No. 6467, Experiment 1. The female type, male allotype, and 13 paratypes are in the National collection. Two paratypes are in the author's collection.

## 89. CALLIMOME AZTECUM (Cameron)

*Torymus aztecus* CAMERON, Invert. Pacif. vol. 1, 1904, p. 59.

The original description is as follows:

*Female*.—Length 2 mm.; ovipositor as long as the body. Head and upper part of thorax with thimblelike punctures, the thorax more strongly than the head. Greenish-blue, the abdomen for the most part blue and violaceous, the coxae and femora blue, tinged with green, the tibiae black, the tarsi white; antennae black, the scape testaceous. Pleurae smooth, largely violaceous; wings hyaline, the nervures black. Eyes brown. Abdominal segments narrowly banded with black. Tegulae fuscous.

*Type locality*.—Mexico.

*Host*.—Unknown.

This species is unrecognized by the writer. Its nearest known relative is *Callimome tricolor* Huber, from which it is easily separated by the color of the tibiae.

It is not known where the type is deposited.

## 90. CALLIMOME ADVENUM Osten Sacken

Figure 30

*Callimome adrena* OSTEN SACKEN, Trans. Amer. Ent. Soc., vol 3, 1870, pp. 59–60, No. 3.

*Female*.—Length 3 mm.; ovipositor 2.25 mm. Green with strong bluish tinge; thoracic dorsum coarsely punctured; head transverse, deeply punctured, the punctures more shallow below the antennae; viewed from front five-sixths as long as wide; facial carina prominent, extending about one-half the distance to the mouth; antennal groove not deep but smooth and finely reticulated within; scape slender, yellow, flagellum light brown, pedicel and ring-joint shining; the pedicel a little longer than first joint of funicle, the last four joints of funicle wider than long, the preceding a very little longer than wide; eyes red and bulging, ocelli pinkish. Thorax elongate, the dorsum clothed with short bristly hairs; pronotum mostly rugose and without many punctures and the posterior margin with a shining purplish band; mesoscutum as long as the scutellum and nearly as wide as long anteriorly; scapulae prominent, the axillae reduced; scutellar cross furrow well defined, the scutellar apex rugose and somewhat shining; propodeum feebly sculptured, shining, but with a prominent median carina and well-developed lateral folds; scutellum as coarsely sculptured as the mesoscutum, the area between the punctures rugose and shining; fore and mid coxae brownish with purplish-blue reflections, brown outside; hind coxae purplish, first two pairs of femora brown except the tips which are yellowish, the hind femora purplish brown except the tips which are light brown; fore

and mid tibiae testaceous, the hind one brown or infuscated, except the tips which are slightly testaceous; tarsi whitish, the last joint brown; marginal vein five-sixths as long as submarginal, stigmal vein sessile; veins yellow. Abdomen green with a bluish tint; longer than the thorax; first and second segments medially incised, the third with only a slight incision.

*Type locality*.—Washington, D. C.

*Host*.—*Diastrophus nebulosus* Osten Sacken.

*Paratype*.—Cat. No. 25392, U.S.N.M.

This species is redescribed from two female paratypes recently received by the National collection from the Cambridge Museum of Natural History, Zoology, and bearing the data "Type No. 812, reared from *Diastrophus nebulosus* Osten Sacken."

The male is described from a series of ten specimens bearing No. 3762x.

*Male*.—Length 1.75 mm. Green but strongly fuscous. Funicle joints all wider than long except the first; coxae brownish, the hind ones with a purplish tinge; femora and tibiae fuscous.

*Distribution*.—Washington, D. C. (Type). In addition to the paratype received from the Cambridge Museum of Comparative Zoology, the National collection contains 15 specimens, No. 3762x, reared from galls of a species of *Cecidomyia*, in the blossoms of *Vernonia noveboracensis* Willdenow, collected by Mr. Pergande at Chain Bridge, Va. One specimen reared from *Oedaspes atra* Loew on *Solidago*, collected by J. C. Bridwell at Glen Echo, Md. Two specimens, Hopkins No. 7223, reared September 16, 1907, from a gall on *Solidago*, collected by E. J. Kraus at Seven Lock, Md.

*Callimome advena* Osten Sacken resembles *Callimome tricolor* Huber, from which it is easily separated by color.

Except the type, which is reported from *Diastrophus nebulosus* Osten Sacken, all other rearings reported have been from Cecidomyid galls. Moreover, Osten Sacken in the reference cited above, mentions five specimens reared from *Asphondylia rudbeckiae conspicua* Osten Sacken by Jacob Stauffer, Lancaster, Pa., which he evidently thought to be the same species he described. From all of the extensive rearings from *Diastrophus nebulosus* Osten Sacken in later years no specimens of *Callimome advena* Osten Sacken have been found. It seems, therefore, that in view of this fact and also that the hosts are quite different, that too much emphasis can not be placed on Osten Sacken's record.

One female of this species was reared, June 21, 1915, from the seeds of *Amelanchieris canadensis* (Linnaeus) Medicus, collected at North East, Pa., by R. A. Cushman. *Callimome amelanchieris* (Cushman) was reared from the same lot of seeds. It is not known whether the species is phytophagous or parasitic.

## 91. CALLIMOME SMITHI (Ashmead)

## Figure 24

*Torymus smithi* ASHMEAD, Mem. Car. Mus., vol. 1, No 4, 1904, p. 398.

The original description follows:

*Female*.—Length 3 mm.; ovipositor longer than the body. Blue, the head and thorax with a thimblelike punctuation, the tips of the scutellum smooth and metallic green; the scape, tegulae, veins, and most of the legs, except the coxae and the femora, are yellowish, the coxae and the hind femora are blue, the front and middle femora above and basally are brownish.

*Type locality*.—Chapada and Para, Brazil.

*Host*.—Unknown.

*Type*.—Cat. No. 8056, U.S.N.M.

Described from two females but represented in the National collection by a single specimen. The head of this specimen is missing and several parts of the body are not in position for study. I have noted, however, that the thoracic dorsum is mostly blue with greenish tints; the abdomen is violaceous as in *Callimome tricolor* Huber; the fore and mid femora are greenish-brown with a slight purplish tint, and the hind femora more distinctly violaceous; tibiae testaceous, the hind ones infusate at the extreme tip; the ovipositor not quite as long as the body.

## 92. CALLIMOME NEUROTERUM (Ashmead)

## Figure 9

*Torymus neuroterus* ASHMEAD, Trans. Amer. Ent. Soc., vol. 14, 1887, p. 188, No. 27.

This species, although first described from several specimens, is now represented in the National collection by a single specimen, the abdomen of which is entirely missing and the remainder so covered with glue that it has been difficult to examine it. For this reason I am including Ashmead's short description, which is as follows:

*Male*.—Length 1.25 mm. A diminutive, metallic green little species with a large transverse head, black antennae, blue or violet colored metathorax and abdomen and metallic green legs, the trochanters, tips of tibiae, and tarsi alone being white. The abdomen is pedunculate.

*Additional notes*: Head with reddish tints in some lights; viewed from front strongly depressed, and clothed with few white, feeble hairs; scape dark greenish-brown, the base lighter; flagellum brown, the joints of funicle not longer than wide; postocellar line about one and one-half times the diameter of posterior ocellus. Thoracic dorsum minutely and not deeply reticulated; somewhat shining and with cupreous tints in some lights; parapsidal furrows not depressed, scarcely visible except toward the posterior; scutellum with reticulations more or less longitudinal, the anterior portion slightly elevated; scutellar apex highly polished; propodeum smooth, shining, purplish,

the anterior margin with very minute pits; thorax ventrally and the coxae a rather delicate purplish, the femora and tibiae a light greenish-brown; veins of wings pale yellow, the stigmal vein sessile. Abdomen missing.

*Type locality*.—Jacksonville, Fla.

*Host*.—*Neuroterus minutissimus* Ashmead.

*Type*.—Cat. No. 2886, U.S.N.M.

### UNRECOGNIZED SPECIES

Unfortunately, I have been unable to recognize 11 of the species which have been placed in this genus. *Callimome lissus*, *theon*, *aea*, *splendidulus*, and *cecidomyiae* were first described by Walker. All of them were taken in America. I have not examined any of the types; it is probable that they are all deposited in the British Museum. Walker's descriptions omit many specific characters and until the types are examined it will not be safe to place the species definitely. Two species *ochreatum* and *pavidum* were described by Say. There is no doubt that *ochreatum* is very closely related to *advenum* but I have done nothing with it for the present. The types have been destroyed by fire. *Callimome thompsoni* (Fyles), apparently a phytophagous species, and *Callimome longicaudum* Provancher were both reported from Canada, while *pallidipes* (Ashmead) was taken in the West Indies; *abortum* (Crosby) is from Kansas.

### 33. CALLIMOME CECIDOMYIAE Walker

*Callimome cecidomyiae* WALKER, Ann. Mag. Nat. Hist., vol. 14, 1884, p. 15.

*Torymus cecidomyiae* (Walker) DALLA TORRE, Cat. Hymen., 1898, vol. 5, p. 302.

This species is unrecognized by the writer; the original description follows; words in italics are my own.

*Female*.—Aureo-viridis, antennis nigris, pedibus flavis viridi et fusco vittatis alis limpidis. Corp. long. lin 1.25 (2.5 mm.); alar lin. 2 (4 mm.).

Body bright golden-green, convex; head and thorax finely squamous, the scales on the head and on the fore part of the thorax so disposed as to form little transverse undulations; head as broad as the thorax; antennae black and subclavate, pubescent, shorter than the thorax; first joint (*scape*) long, slender, green, fulvous at the base; second (*pedicel*) cyathiform; third and fourth (*evidently mistaken for the single ring joint*) very minute; fifth and following joints to the eleventh (*tenth*) successively but very slightly shorter and broader; club linear, conical at the tip, a little broader than the eleventh joint and more than twice its length; thorax elliptical; prothorax transverse, narrower in front, its breadth more than twice its length; scutum of the mesothorax long; sutures of the parapsides distinct, approaching each other; axillae large, triangular, not conniving; scutellum somewhat rhomboidal, metathorax transverse, very short; propodeum transverse, rather short, very slightly decumbent; podoon (*petiole*) extremely short; abdomen fusiform, smooth, shining, narrower, but not larger than the thorax, blue towards the base; the segments, except the metapodeon (*first abdominal segment*) very minutely squamous; metapodeon occupying less than one-third of the dorsum, slightly dehiscent on the middle of the hind border; octoon

and eunator of moderate length; deca-ton longer than the eunaton; protelum shorter than the eunaton; paratelum still shorter; telum very short; sheaths of the oviduct black, pubescent, much longer than the abdomen; legs yellow; coxae green; a longitudinal stripe of green on each of the metafemora, and the same fuscous on each metatibia; mesotarsi and metatarsi straw color, fuscous at the tips; wings limpid, broad, very long, reaching when at rest to half the length of the sheaths of the oviduct; nervures piceous; humerus much less than half the length of the wing; ulna much shorter than the humerus; radius hardly longer than one-sixth of the ulna; cubitus half the length of the radius; stigmal small, emitting a very short branch.

*Type locality*.—Canada; Martin Falls, Albany River, Hudson Bay.

*Host*.—" *Cecidomyia communis* Branston's MSS."

*Type*.—Probably in British Museum.

#### 94. CALLIMOME SPLENDIDULUS (Dalla Torre)

*Callimome splendidus* (Barnstorff) WALKER, Ann. Mag. Nat. Hist., vol. 14, 1844, p. 14 (not Förster nor Perty).

*Torymus splendidulus* DALLA TORRE, Cat. Hymen., vol. 5, 1898, p. 313.

Due to the inaccessibility of the above publication to many students I am including the original description of this species. The words in italics are my own and are added for the sake of clearness.

*Females*.—Viridis cupreo varius, abdomine purpureo, antennis nigris, pedibus rufis, alis subfulvis. (Corp. long. lin. 2; Alar. lin. 3.)

Body convex, thinly clothed with hairs; head and thorax minutely squameous; the scales on the head and on the fore part of the thorax so disposed as to form little transverse undulations; head green, aeneous in front, as broad as the thorax; eyes and ocelli red; mandibles fulvous; antennae black and clavate, pubescent, shorter than the thorax; first joint fulvous, long, slender; second (*pedicel*) long-cyathiform; third and fourth very minute; (*it is my opinion that what appeared to Walker to be two joints was in reality one joint, viz, the ring-joint*); fifth and following joints to the eleventh successively shorter and broader; club linear, conical at the tip, more than twice the length of the eleventh joint (= *tenth joint*); thorax elliptical, green; prothorax transverse, forming in front a slender neck which joins the head, its breadth more than twice its length; scutum of the mesothorax long; sutures of the parapsides distinct, approaching each other; axillae large, triangular, not conniving; scutellum nearly rhomboidal; meta-thorax cupreous, transverse, very short; propodeum cupreous; large, subquadrate, almost horizontal, having a few little ridges (*carinae*) along the middle; pondeon (*petiole*) extremely short; abdomen elliptical, purple, very minutely squameous (*reticulated*), varied with green on each side, nearly as long and as broad as the thorax; metapodeon (*first abdominal segment*) occupying more than one-third of the dorsum, slightly dehiscent (*incised*) on the middle of the hind border, having a little channel at the base; octoon a little shorter than the metapodeon; eunaton much shorter than the octoon; deca-ton still shorter; protelum, paratelum and telum very short; segments of the thorax partly cupreous, very minutely squameous, having a suture along the middle; ventral segments of the abdomen concealed by those of the dorsum; legs pale red; sheaths of the oviduct black, pubescent, a little longer than the abdomen; coxae green, scaly; wings slightly tinged with yellow; nervures fulvous; humerus much less than half the length of the wings; ulna much shorter than the humerus; radius much shorter than one-fourth the length of the ulna; cubitus not half the length

of the radius; stigma of moderate size, emitting a thick branch toward the tip of radius.

*Type locality*.—America.

*Host*.—Unknown.

*Type*.—Probably in British Museum.

#### 95. CALLIMOME LISSUM Walker

*Callimome lissus* WALKER, Ann. Ent. Soc. Fr., vol. 1, p. 150, 1843.

*Syntomaspis lissus* (Walker) ASHMEAD, Trans. Amer. Ent. Soc., vol. 14, 1887, p. 187.

*Type locality*.—United States.

*Type*.—Probably in British Museum.

It should be noted that Dalla Torre in his *Catalogus Hymenopterorum* (vol. 5, 1898) has made what is evidently a typographical error. He has listed *Callimome lissus* Walker and *Callimome cissus* Walker, giving the same reference for each. The reference cited makes no mention of the latter name.

#### 96. CALLIMOME THEON Walker

*Callimome theon* WALKER, Ann. Ent. Soc. Fr., vol. 1, p. 150, 1843.

*Syntomaspis theon* (Walker), ASHMEAD, Trans. Amer. Ent. Soc., vol. 14, 1887, p. 187.

*Type locality*.—United States.

*Type*.—Probably in British Museum.

#### 97. CALLIMOME AEA Walker

*Callimome aea* WALKER, Ann. Mag. Nat. Hist., vol. 12, 1843, p. 104.

*Torymus aea* (Walker) DALLA TORRE, Cat. Hymen., 1898, vol. 5, p. 297.

*Type locality*.—New York.

*Type*.—Probably in British Museum.

#### 98. CALLIMOME ABORTUM (Crosby)

*Megastigmus? flavipes* ASHMEAD, Kans. Agr. Exp. Sta. Bull. 3, 1888, p. 3, not *Megastigmus flavipes* ASHMEAD, Trans. Amer. Ent. Soc., vol. 13, 1886, p. 128, not *Callimome flavipes* WALKER, Ent. Mag., vol. 1, 1883, p. 124.

*Torymus abortus* CROSBY, Ent. News, vol. 25, 1914, p. 27.

*Type locality*.—Kansas.

*Host*.—Cecidomyid on cedar.

*Type*.—Cat. No. 27290 U.S.N.M.<sup>12</sup>

#### 99. CALLIMOME LONGICAUDUM Provancher

*Callimome longicauda* PROVANCHER, Nat. Can., vol. 14, 1883, p. 34, No. 2.

Translation of the original description follows:

*Female*.—Length 3 mm. Brilliant metallic green; the face golden. Antennae black. Wings hyaline. The tibiae and tarsi pale yellow, the coxae and femora

<sup>12</sup> The type of this species was received by the United States National Museum from the Kansas Agricultural College after Mr. Huber's visit to the Museum. S. A. Rohwer.

the color of the body. First abdominal segment entirely covering the second. Ovipositor black, twice the length of the body.

Captured at Toronto on *Quercus alba* Linné. It is separated especially from *fagopyrum* by the length of its ovipositor and the color of its coxae and femora.

*Type locality*.—Toronto, Canada.

*Host*.—Unknown.

100. CALLIMOME PALLIDIPE (Ashmead)

*Torymus pallidipes* ASHMEAD, Jour. Linn. Soc. Lond. Zool., vol. 25, 1894, p. 153.

The original description follows:

*Female*.—Length 2 mm. Slender; head and thorax metallic green, shagreened; abdomen blue-green, smooth; scape and legs, except hind coxae, pale yellowish; flagellum dark brown, the first joint the longest, the following a little longer than thick. Collar triangular; mesonotum longer than wide, with distinct furrows; scutellum about twice as long as wide, the axillae large, projecting slightly forward into the parapsidal field; metathorax smooth, the spiracles rather large, oval. Wings hyaline, the tegulae and venation yellowish, the marginal vein nearly as long as the submarginal, the stigmal vein very minute.

*Type locality*.—St. Vincent.

*Host*.—Unknown.

*Type*.—Probably in British Museum.

This species was described from two specimens, neither of which is in the National collection.

101. CALLIMOME THOMPSONI (Fyles)

*Torymus thompsoni* FYLES, Can. Ent., vol. 36, 1904, p. 106.

*Type locality*.—Quebec, Canada.

*Host*.—Plum.

Types were sent to the United States National Museum according to the above reference. It seems, however, that they either have been misplaced or lost, for they can not be found.

Mr. Fyles reports having observed this species ovipositing in plums. "As many as 30 of the insects" were found on one plum. "Some of plums attacked showed signs of previous attack of the Curculio, but most of them did not. Whether the larvae of the species feed on the flesh and juices of the plum or attack the grubs of the Curculio" was not determined.

102. CALLIMOME PAVIDUM (Say)

*Torymus pavidus* SAY, Writ. of Say, Le Conte, vol. 2, p. 723.

I have not recognized this species, the type of which has been destroyed. The original description follows:

Cupreous green; no large punctures; tibiae and tarsi yellowish. Inhabits Indiana.

Body coppery greenish, with the appearance of minute granules or scales; antennae black; hypostoma with the carinate line very distinct; mandib



piceous; wings hyaline; nervure pale brownish; abdomen bluish-green; feet honey yellow; thighs bluish-green; posterior pair of tarsi whitish. The surface has no large and obvious punctures which distinguish it from *Callimome* (*Torymus*) *ochreatum* Say. Length of male nearly one-tenth of an inch.

*Host*.—Unknown.

103. *CALLIMOME OCHREATUM* (Say)

*Torymus ochreatus* SAY, Writ. of Say, LeConte, vol. 2, p. 723.

This species has not been recognized; the type unfortunately has been destroyed by fire. The original description is included here in the hope that it will facilitate identification by others.

Green, tinged with blue; base of the antennae, tibiae and tarsi whitish. Inhabits Indiana.

Body bright green, more or less tinged on the pleurae, abdomen and thighs with blue or purplish; reticulately punctured; antennae black; first joint before dull whitish; mandibles and palpi piceous; scutel, on the posterior half with very small punctures; wings hyaline; nervure brown; abdomen polished, impunctured; terminal joint of female brassy; oviduct as long as the body, fuscous; tibiae and tarsi whitish.

Length one-tenth of an inch.

The minute puncturation of the posterior half of the scutel strongly contrasts with the large discoidal punctures of the basal half. The male has generally more of the purple tinge.

*Host*.—Receptacle of a *Liatrix*.

Although this species is closely related to *Callimome advena* Osten-Sacken it is not identical.

SPECIES WRONGLY CLASSIFIED AS *CALLIMOME* (*SYNTOMASPIS*  
OR *TORYMUS*)

Subfamily CALLIMOMINAE

*ALLOTORYMUS*, new genus

*Genotype*.—*Syntomaspis splendens* Provancher as determined by myself and as treated below.

This genus belongs to the Callimomidae and is closely related to *Ecdamus* Walker, from which it is separated as follows: The prothorax is nearly quadrate and not conical; it is, however, very well developed. The petiole is not as long as the metathorax, but only as long as the metanotum; and there is a distinct cross furrow on the scutellum. In addition the wings are not clearly hyaline.

*Generic characters*.—Head transverse and with a foraminal margin; eyes bare and ocelli unusually small; antennae 13 jointed, with one ring-joint. Prothorax extremely well developed, being almost as long as wide and as seen from above nearly quadrate; mesepimeron deeply notched; propodeum long and broad; scutellum with a conspicuous cross furrow; hind femora smooth; stigmal vein rather elongate; abdomen with a petiole a little longer than the metanotum.

## ALLOTORYMUS SPLENDENS (Provancher)

*Syntomaspis splendens* PROVANCHER, Addit. Faun. Can. Hymen., 1887, p. 196.

*Female*.—Length 4 mm.; ovipositor 3.5 mm. Brilliant cupreous with a bronzy or fuscous tint. Head and thoracic dorsum very finely punctured and polished, and with numerous shallow umbilications irregularly placed; head distinctly wider than the thorax, the face clothed sparsely with feeble hairs; scrobes very shallow and not more finely sculptured than face; ocelli amber and very small, forming nearly a thirty-degree angle at the median ocellus; posterior ocelli dividing the vertex into three equal parts; eyes brunneous; antennae as long as the thorax, scape yellowish and longer than the pedicel, ring-joint and first funicle joint combined; base of scape somewhat rounded to form a semi-knob; pedicel ferruginous, a little darker than the scape and shorter than the first joint of funicle; flagellum black; base of first joint of funicle three-fourths as wide as the opposite end, and two-fifths as wide as the first joint of the club. Thorax elongate, being more than twice as long as wide at the tegulae; pronotum nearly square, being a little produced anteriorly; parapsidal grooves nearly straight; apical one-third of scutellum more highly polished than the anterior portion; propodeum long, deeply sculptured with an inverted Y-shaped carina, the anterior margin deeply pitted; fore coxae ferruginous, coppery at the base; mid coxae and hind coxae green with a coppery reflection, the latter more deeply sculptured than any other part of the body; femora and tibiae castaneous; tarsi ferruginous; the hind tibiae straight; abdomen very strongly carinate, five-sixths as deep as long and not quite one-half as wide as deep; petiole a little longer than the metanotum; first segment of abdomen green; abdomen tinged with purple in some lights and as long as thorax.

*Male*.—Length 3.2 mm. Antennae not so distinctly clubbed as in female; scape yellowish and more curved, the knoblike process at base more conspicuous. Abdomen depressed and shorter than the thorax.

Redescribed from five specimens in the United State National Museum.

*Type locality*.—Canada.

*Host*.—Unknown.

The type of this species was deposited in the Harrington collection, but is now in the Museum at the Department of Agriculture, Ottawa, Ontario, Canada. I have not had opportunity to examine the type personally, but through the kindness of J. McDunnough, from the above-named institution much valuable information has been obtained. The type consists of one female, the abdomen of which is missing. The female from which my description was drawn was

compared with the type by McDunnough, who at the same time answered a series of queries concerning the type. I am firmly convinced that the specimens I have described are identical with the type.

*Distribution*.—Canada (type). One male and three females from Greeley, Colo., and one male from Vancouver Island, Canada, are in the National collection.

### Subfamily MONODONTOMERINAE

#### PLATYKULA, new genus

*Genotype*.—*Syntomaspis albihirta* Ashmead.

When this species was described it was noted by Ashmead that it was "very distinct from any other" in the genus. Indeed, it belongs to a different subfamily, as is indicated above. Inasmuch as it has not been possible to place it in any of the existing genera, it has become necessary to erect a new genus. I have proposed the name *Platykula*.

*Generic characters*.—Antennae 13-jointed with 2 ring joints; funicle 6-jointed; occiput with a foraminal margin; thoracic dorsum clothed with appressed silvery-white hairs; mesepimeron without an incision, but with a rather deep depression just beyond the middle; spiracular sulci conspicuous; stigmal vein nearly sessile with hair veins radiating from it; postmarginal vein as long as the combined width of marginal plus the length of stigmal vein; marginal vein three-fifths as long as submarginal; wings hyaline; hind femora smooth on their lower margin; first and second segments of abdomen slightly incised.

*Platykula* can be separated from its most closely related genera as follows: *Dimeromicrus* Crawford does not have white appressed hairs, a depression in the mesepimeron, spiracular sulci, and a short pronotum; it has the third and fourth abdominal segments incised. *Idiomacromerus* Crawford has a stigmal vein that is nearly half as long as the marginal and only a little shorter than the postmarginal and a spotted wing; it does not have appressed hairs on the body. *Liodontomerus* Gahan has a long stigmal vein, which in the type is about two-thirds as long as the post marginal and four-fifths as long as the marginal; it does not have spiracular sulci, and a margined occipital foramen. It also differs from *Plesiostigmodes* Ashmead in some important respects.

#### PLATYKULA ALBIHIRTA (Ashmead)

*Syntomaspis albihirta* ASHMEAD, Trans. Amer. Ent. Soc., vol. 14, 1887, p. 187.

*Female*.—Length 2.5 mm.; ovipositor 0.8 mm. Entirely black. Head transverse, wider than the thorax, and minutely punctured;

antennae attached a little below the middle of the front, the antennal depression very shallow; scape, pedicel and two ring-joints testaceous; pedicel and ring-joint combined longer than the first joint of the funicle; joints of funicle all longer than wide and somewhat darker than the scape, and gradually growing wider toward the tip; the ocellular line about twice the length of the diameter of the median ocellus; eyes reddish. Thorax shorter than the abdomen and minutely punctuate; parapsidal furrows not very distinct, visible only at certain angles; propodeum with a median carina and large pits at the anterior margin; coxae fuscous, the femora a lighter brown; fore and mid tibiae testaceous, the hind ones fuscous, except the tips; tarsi with last joint brown. Abdomen very flat, the segments almost truncate dorsally; fourth segment about one-third longer than the third; ovipositor shorter than the abdomen.

*Male*.—Length 1.3 mm.; scape and flagellum dark brown; legs a little darker than in the female. Abdomen greatly depressed.

*Type locality*.—Jacksonville, Fla.

*Host*.—Unknown.

*Type*.—Cat. No. 25406, U.S.N.M.

Redescribed from the female type and a male from the same locality. Both these specimens are in the National collection, and the male is here described for the first time.

#### DIMEROMICRUS HOWARDI (Dalla Torre)

*Torymus ventralis* HOWARD, Journ. Linn. Soc. Lond. Zool., vol. 26, 1896, p. 135.

*Torymus howardi* DALLA TORRE, Cat. Hymen., vol. 5, 1898, p. 307. New name for *Torymus ventralis* Howard preoccupied by *Tcrymus ventralis* Fonscolombe.

*Type locality*.—Grenada, West Indies.

*Host*.—Unknown.

*Type*.—Cat. No. 6541, U.S.N.M.

The type consists of a single male specimen collected by H. H. Smith and recorded under No. 30. It is in a very poor condition for study and hence it has been difficult to classify it; I have placed it tentatively in the above-named genus.

#### DIMEROMICRUS EUCALYPTI (Ashmead)

*Torymus eucalypti* ASHMEAD, Proc. Linn. Soc. New South Wales, vol. 30, 1900, p. 331.

*Type locality*.—Sydney, New South Wales.

*Host*.—Unknown.

*Type*.—Cat. No. 4877, U.S.N.M.

Originally described from eight specimens. The National collection contains seven specimens, four of which are somewhat broken. This species is very close to *Dimeromicrus australiensis* Girault.<sup>13</sup>

<sup>13</sup> Mem. Queen. Mus., vol. 4, p. 277.

**DIMEROMICRUS GIFUENSIS (Ashmead)**

*Torymus gifuensis* ASHMEAD, Journ. New York Ent. Soc., vol. 22, 1904.

*Type locality*.—Japan.

*Host*.—Unknown.

*Type*.—Cat. No. 7146, U.S.N.M.

This species was described from one male and two females, taken in October, 1902. In the National collection.

**DIAMORUS AXILLARIS (Ashmead)**

*Torymus axillaris* ASHMEAD, Trans. Amer. Ent. Soc., vol. 21, 1894, p. 333.

*Type locality*.—Morgantown, W. Va.

*Host*.—Unknown.

*Type*.—Cat. No. 25405, U.S.N.M.

Described from one female taken May 11, 1891, by Dr. A. D. Hopkins and recorded under No. 3301. Deposited in the National collection.

**MICRODONSOMERUS ANTHIDII (Ashmead)**

*Torymus anthidii* ASHMEAD, Ent. News, vol 7, 1896, p. 26.

*Type locality*.—Los Angeles, Calif.

*Host*.—From a cell of (*Anthidium*) *Dianthidium consimile* (Ashmead).

*Type*.—Cat. No. 25404, U.S.N.M.

The National collection contains nineteen specimens.

**CRYPTOPRISTRUS LAZUELLA (Ashmead)**

*Syntomaspis lazuella* ASHMEAD, Bull. Colo. Biol. Assoc., vol. 1, 1890, p. 26.

*Type locality*.—West Cliff, Colo.

*Host*.—Unknown.

*Type*.—Cat. No. 25403, U.S.N.M.

Besides the type female the National collection contains 20 specimens bearing No. 632.

**EXPLANATION OF PLATES**

The first three plates illustrate the shape of the stigmal veins of most of the species of *Callimome* mentioned in this paper. The sketches were all made by the author with the aid of a compound microscope and a camera lucida. All are drawn to the same scale.

**PLATE 1****Stigmal veins of *Callimome***

- FIG. 1. *Callimome thalassinum* (Crosby).  
2. *Callimome montserratii* (Crawford).  
3. *Callimome umbilicatum* (Gahan).  
4. *Callimome osborni* Huber.  
5. *Callimome holcaspoidea* (Ashmead).  
6. *Callimome solidaginis* Huber.

- FIG. 7. *Callimome lividum* (Ashmead).  
8. *Callimome punctifrons* (Ashmead).  
9. *Callimome neuroterum* (Ashmead).  
10. *Callimome dasyneurae* Huber.  
11. *Callimome aeneum* Ashmead.  
12. *Callimome hainesi* (Ashmead).  
13. *Callimome sativae* Huber.  
14. *Callimome bicoloratum* Huber.  
15. *Callimome rubenidis* Huber.  
16. *Callimome minutissimum* Huber.  
17. *Callimome prunicola* Huber.  
18. *Callimome tarsale* Huber.  
19. *Callimome rohweri* Huber.  
20. *Callimome hirsutum* Huber.  
21. *Callimome capillaceum* Huber.  
22. *Callimome anthomyiae* (Ashmead).  
23. *Callimome dryophantae* (Ashmead).  
24. *Callimome smithi* (Ashmead).  
25. *Callimome rugosipunctatum* (Ashmead)  
26. *Callimome cruentatum* Huber.  
27. *Callimome tricolor* Huber.  
28. *Callimome albitarse* Huber.  
29. *Callimome multicolor* Huber.  
30. *Callimome advenum* Osten Sacken.  
31. *Callimome tubicola* Osten Sacken.  
32. *Callimome occidentale* Huber.  
33. *Callimome brodiei* (Ashmead).  
34. *Callimome melanocerae* Ashmead.  
35. *Callimome gahani* Huber.  
36. *Callimome warreni* (Cockerell).  
37. *Callimome mexicanum* (Ashmead).  
38. *Callimome giganticum* Huber.  
39. *Callimome racemareae* Ashmead.  
40. *Callimome coeruleum* Ashmead.  
41. *Callimome elegantissimum* Ashmead.

## PLATE 2

Stigmal veins of *Callimome*

All the species illustrated on this plate belong to Group B.

- FIG. 42. *Callimome bedeguaris* (Linnaeus). Genotype. (European).  
43. *Callimome druparum* (Boheman).  
44. *Callimome sapporensis* (Ashmead).  
45. *Callimome atripleicis* Huber.  
46. *Callimome flavicorum* Osten Sacken.  
47. *Callimome fulvum* Huber.  
48. *Callimome alamedensis* Huber.  
49. *Callimome dubiosum* Huber.  
50. *Callimome longiligum* Huber.  
51. *Callimome strobiloides* Huber.  
52. *Callimome amelanchieris* (Cushman).  
53. *Callimome sylvicola* (Ashmead).  
54. *Callimome japonicum* (Ashmead).

- FIG. 55. *Callimome duplicatum* Huber.  
56. *Callimome aeneoscapum* Huber.  
57. *Callimome baccharidis* Huber.  
58. *Callimome asteridis* Huber.  
59. *Callimome alaskensis* Huber.  
60. *Callimome ebrum* Osten Sacken.  
61. *Callimome ferrugineipes* Huber.  
62. *Callimome magnificum* Osten Sacken.  
63. *Callimome chrysochlora* Osten Sacken.  
64. *Callimome sackeni* Ashmead.  
65. *Callimome mellipes* Huber.  
66. *Callimome persimilis* (Ashmead).  
67. *Callimome citripes* Huber.  
68. *Callimome flaviventris* (Ashmead).  
69. *Callimome missouriensis* Huber.  
70. *Callimome coloradensis* Huber.  
71. *Callimome hircinum* (Ashmead).  
72. *Callimome pilularidis* Huber.

## PLATE 3

Stigmal veins of *Callimome*. Leg of *Monodontomerus* and *Callimome*

Numbers 73 to 90, inclusive, represent European species, not discussed in the text, that are in the National collection. The remaining numbers represent native species. The two sketches at the bottom represent parts of the hind legs of the genus *Callimome* and the genus *Monodontomerus*. The rather prominent spurs on the lower margin of the hind femora serve to distinguish the two genera. This however, is not the only point of difference.

- FIG. 73. *Callimome nobilis* (Boheman).  
74. *Callimome tipulariarum* (Zetterstedt).  
75. *Callimome abbreviatum* (Boheman).  
76. *Callimome glechomae* (Mayr).  
77. *Callimome lasiopterae* (Giraud).  
78. *Callimome macropterum* (Walker).  
79. *Callimome amoenum* (Boheman).  
80. *Callimome regium* (Nees).  
81. *Callimome lazulina* (Förster).  
82. *Callimome speciosum* (Boheman).  
83. *Callimome auratum* (Fourcroy).  
84. *Callimome eurynotum* Walker.  
85. *Callimome fastuosum* (Boheman).  
86. *Callimome pallidicornis* (Boheman).  
87. *Callimome erucarum* (Schränk).  
88. *Callimome igniceps* (Thompson).  
89. *Callimome caudatum* (Boheman).  
90. *Callimome abdominale* (Boheman).  
94. *Callimome sulcatum* Huber.  
95. *Callimome rhoditidis* Huber.  
96. *Callimome rosae* Huber.  
97. *Callimome rudbeckiae* (Ashmead).  
98. *Callimome scalaris* Huber.  
99. *Callimome kinseyi* Huber.  
100. *Callimome capite* Huber.

## PLATE 4

## Callimome adult and details

The large drawing represents a typical specimen of Group A. It will be noted that the stigmal vein is sessile and that the cross furrow is present on the apical one-third of the scutellum. In Group B the stigmal vein is petioled and the cross furrow on the scutellum is generally not readily conspicuous. The smallest joint of the antennae is the ring-joint. The submarginal vein is always longer than the marginal vein.

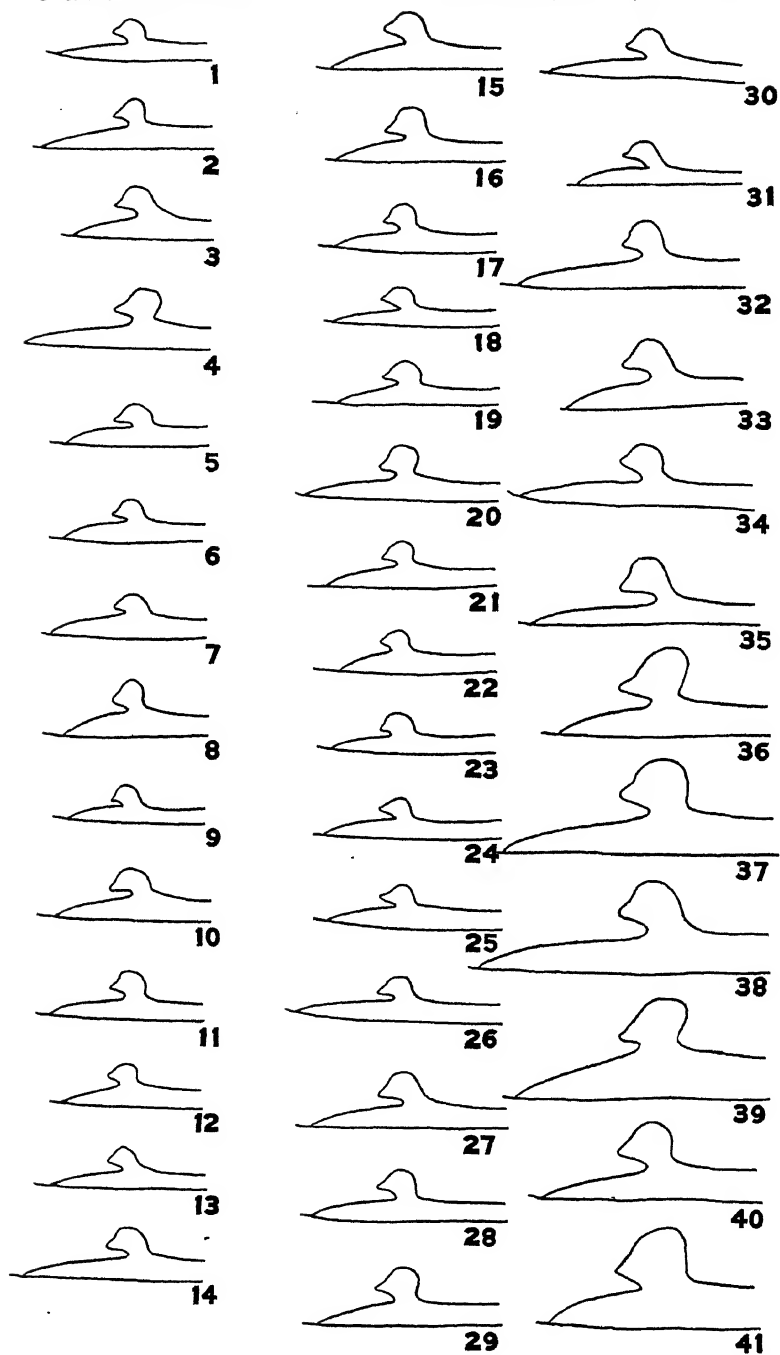
For subfamily characters the reader will observe the two tibial spurs on the hind tibia, the relatively smooth lower margin of the femora, and the thirteen joints of the antenna. The comparative sizes of the fore and hind femorae are also shown (fig. 4).

There are in the main two principal types of sculpture. The most common type in Group A is made of punctures of various sizes. On the smaller species the punctures are generally very close together, while on species as large as *californicum* the punctures are very large. The two sketches (figs. 1 and 2) are drawn to scale from areas on the thorax. Most of the species in group B have a more rugose type of sculpture as is indicated in the sketch to the right (fig. 3).

The side view drawing (fig. 5) of the thorax shows the principal characters mentioned in the keys.

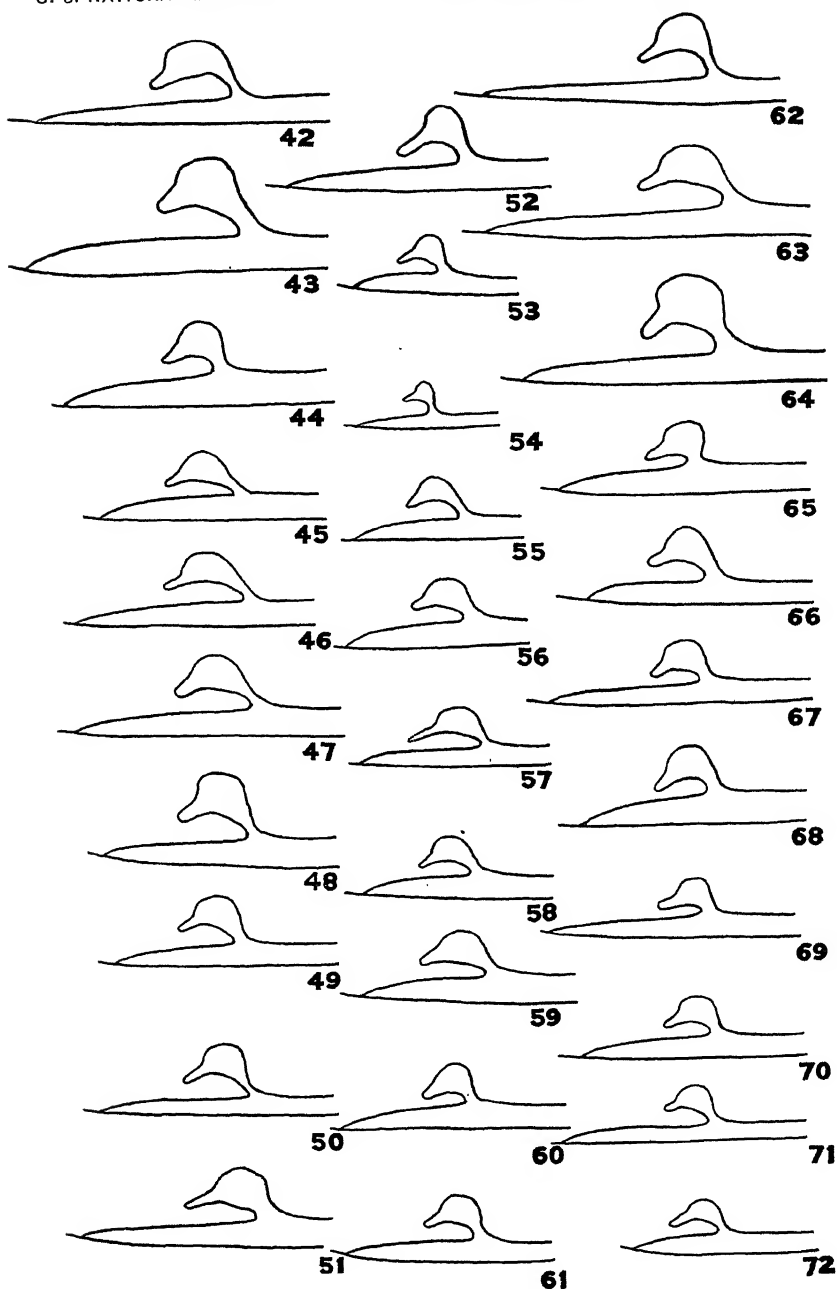






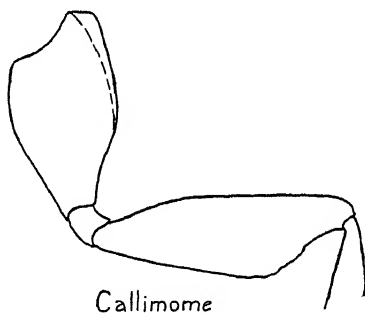
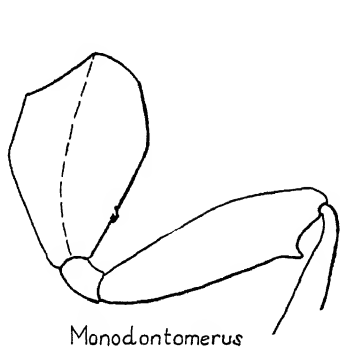
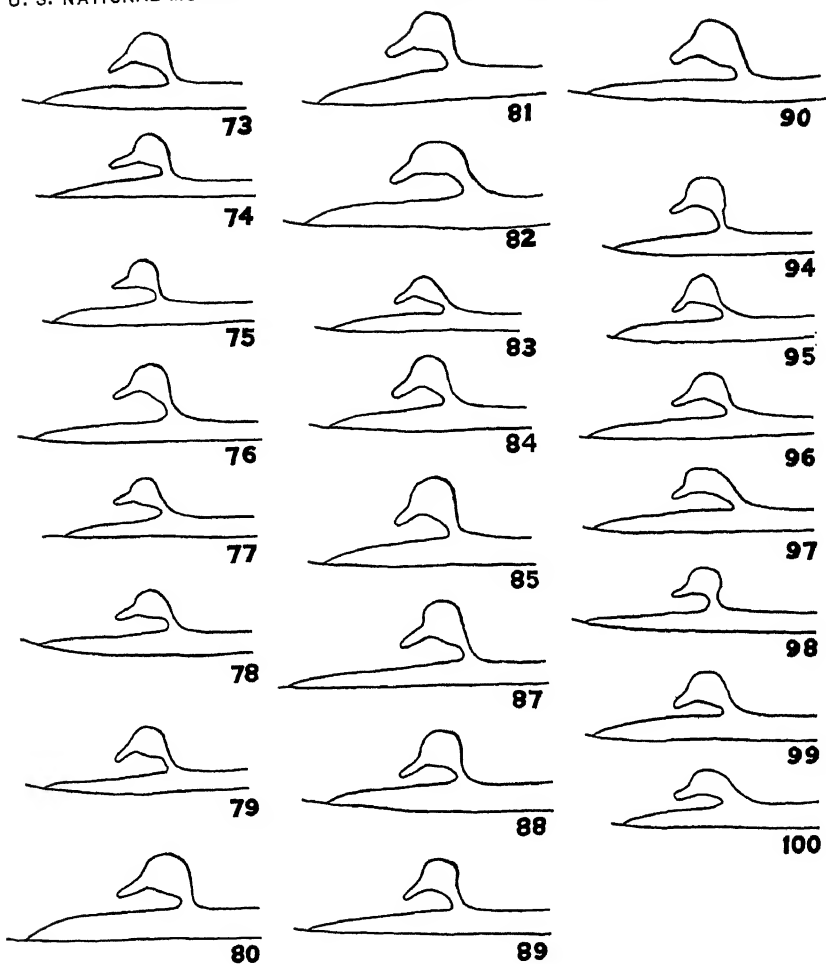
## STIGMAL VEINS OF CALLIMOME

FOR EXPLANATION OF PLATE SEE PAGE 108 AND 109



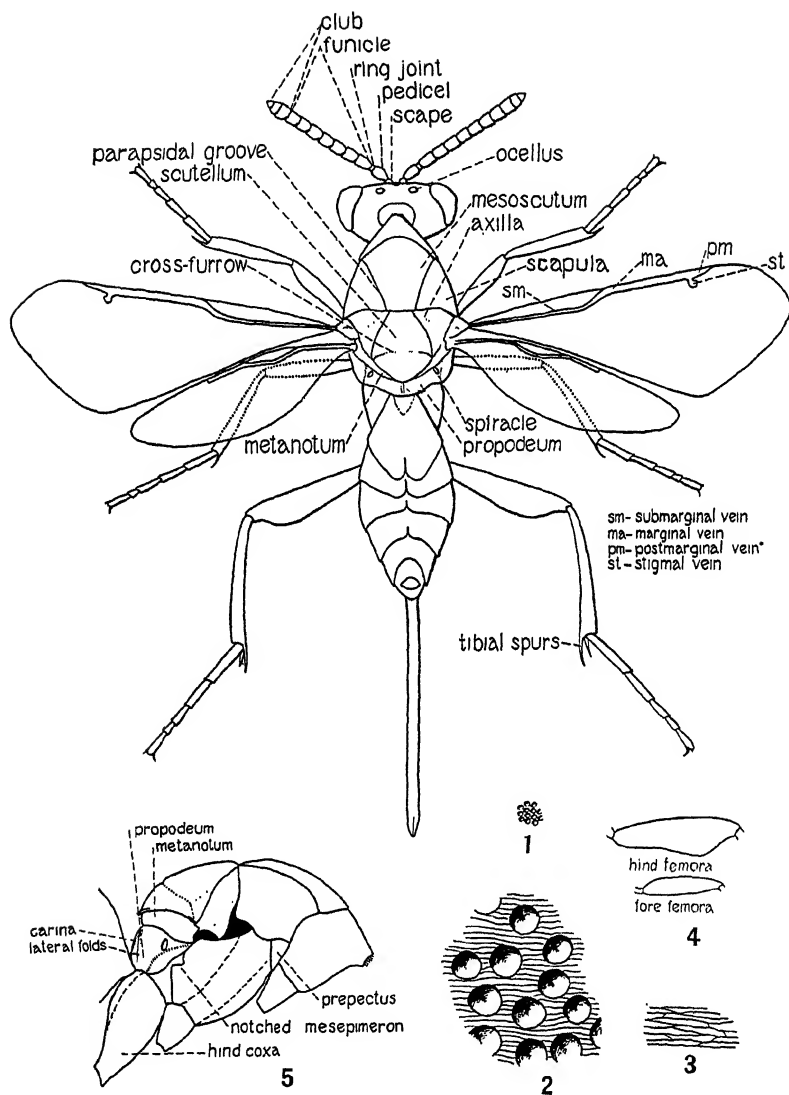
## STIGMAL VEINS OF CALLIMOME

FOR EXPLANATION OF PLATE SEE PAGE 109 AND 110



STIGMAL VEINS OF CALLIMOME

FOR EXPLANATION OF PLATE SEE PAGE 110



CALLIMOME ADULT AND DETAILS

FOR EXPLANATION OF PLATE SEE PAGE IIII

# SPECIES INDEX

The following index includes all the species of chalcid-flies treated in this paper. Valid generic names are in boldface; valid specific names in roman; synonyms in *italics*.

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# GENERIC NAMES APPLIED TO BIRDS DURING THE YEARS 1916 TO 1922, INCLUSIVE, WITH ADDITIONS TO WATERHOUSE'S "INDEX GENERUM AVIUM"

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This is the fourth list<sup>1</sup> of generic names of birds compiled by me to serve as supplements to Waterhouse's "Index Generum Avium." It is not as extensive as the previous lists, owing to several circumstances, chief of which is that the literature has been fairly well searched by this time and further omissions from Waterhouse are not easy to find.

There are about 435 names listed beyond, of which 378 were proposed during the period of 1916 to 1922; the remainder consist for the most part of names hitherto overlooked, a majority of them brought to light through the researches of Messrs. Mathews and Iredale. As in the previous supplement, the derivation of names is added when supplied by the original author.

I am indebted to several friends for calling attention to certain names that had been missed: Thomas E. Penard furnished the reference to *Brubru*, Dr. Herbert Friedmann that to *Demelioterucus*, Dr. A. Wetmore that to *Fontinalis*, and E. C. Stuart Baker gave me a clue to the origin of *Cursonia*, while K. L. Skinner furnished me with a copy of the paper in which the last name was published. Dr. Nagamichi Kuroda kindly sent references to the new names in Momiya's "Birds of Micronesia," a work that was until recently inaccessible to me.

In the third supplement there were some omissions of page references, and certain errors have been since discovered, all of which may be conveniently mentioned or corrected here.

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<sup>1</sup>The earlier lists were as follows: "List of generic terms proposed for birds during the years 1890 to 1900 inclusive, to which are added names omitted by Waterhouse in his 'Index Generum Avium'" (Proc. U. S. Nat. Mus., vol. 24, No. 1267, May 2, 1902, pp. 663-729); "Generic names applied to birds during the years 1901 to 1905, inclusive, with further additions to Waterhouse's 'Index Generum Avium'" (Proc. U. S. Nat. Mus., vol. 35, No. 1656, Dec. 16, 1908, pp. 583-655); "Generic names applied to birds during the years 1906 to 1915, inclusive, with additions and corrections to Waterhouse's 'Index Generum Avium'" (Proc. U. S. Nat. Mus., vol. 53, No. 2221, Aug. "16"—25, 1917, pp. 565-636).



On page 568, the statement that "*Stomiopera* Reichenbach = *Stomioptera*" is incorrect. Reichenbach introduced the name as *Stomiopera*, as correctly given by Waterhouse; *Stomioptera* is an emendation of Gray, 1855.

The type of *Alophus* Malherbe, is by subsequent designation of Stejneger, 1886 (Proc. U. S. Nat. Mus., ix, p. 123), if not of some earlier author.

*Tinamus* Hermann, 1783. The type, by subsequent designation, appears to be Apstein, 1915.

The type of *Lineocantor* Maynard is by designation of the A. O. U. Committee (Auk, xxvi, 1909, p. 301).

*Pseudocolopteryx* Lillo. The second page reference given should be 48, not "45."

*Nycthemerus* Swainson, 1834. The page reference to the original edition of Murray's Encyclopaedia of Geography is 264, fig. 80.

On page 603, footnote no. 4, the page reference to Brasil's paper should be 382, 383, instead of "66-67."

References to generic names in the original edition of Bartram's "Travels," 1791, should have the following page citations: *Cygnus*, 294; *Linaria*, 291; *Lucar*, 290; *Luscinia*, 292; *Merula*, 290bis; *Morinella*, 294; *Petrella*, 295; *Regulus*, 291; *Ruticilla*, 292.

As in previous lists, the names of fossil genera are indicated by a †.

*Achaetops* A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 227.

Type, *Sphenoeacus pycnopygius* SCLATER. [Turdoididae.]  
(Monotypy.)

*Adamatornis* A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 219.

Type, *Cuculus klaas* STEPHENS. [Cuculidae.]  
(Monotypy.)

*Adetococcyx* A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 219.

Type, *Chrysococcyx intermedius* HARTLAUB. [Cuculidae.]  
(Monotypy.)  
(Subgenus of *Chrysococcyx*.)

*Aerospiza* A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 208.

Type, "*Astur tachiro* (Daudin) and its allies in Africa." [Buteonidae.]

*Aethia* B. MERREM,<sup>2</sup> "Vers. Grundr. Allg. Gesch. u. nat. Eintheil d. Vög. i. Tentamen Nat. Syst. Av. pp. 7, 13, 20," 1788 (see Hartert, Novit. Zool. xxiii, 1916, 339-340).

Type, *Alca cristatella* PALLAS. [Alcidae.]  
(Monotypy.)

*Aethiocinnyris* A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 254.

Type, seems to be a lapsus for *Notiocinnyris* ROBERTS. [Nectariniidae.]

<sup>2</sup> I have not seen Merrem's work, which seems to be little known. Doctor Hartert says the German edition has only vernacular names, hence the name *Aethia* should, perhaps, have been credited to the Latin edition, "Primae lineae ornithologiae," of which there were two parts, published in 1787-88.

- Afraegialis** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 200.  
 Type, *Charadrius venustus* FISCHER and REICHENOW. [Charadriidae.]  
 (Monotypy.)  
 (Subgenus of *Charadrius*.)
- Afranas** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 204.  
 Type, *Anas undulata* DUBOIS. [Anatidae.]  
 (Monotypy.)
- Afranthis** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 256.  
 Type, *Anthus brachyurus* SUNDEVALL. [Motacillidae.]  
 (Original designation and monotypy.)
- Afrardea** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 203.  
 Type, *Ardea melanocephala* VIGORS and CHILDREN. [Ardeidae.]  
 (Original designation and monotypy.)  
 (Subgenus of *Ardea*.)
- Africorys** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 260.  
 Type, *Mirafra a. africana* A. SMITH. [Alaudidae.]  
 (Original designation.)
- Afrocichla** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 228.  
 Type, *Turdus olivaceus* LINNAEUS. [Turdidae.]  
 (Original designation.)
- Afropelia** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 197.  
 Type, *Columba capicola* SUNDEVALL. [Columbidae.]  
 (Original designation.)
- Agapetornis** C. CHUBB, Birds Brit. Guiana, I, 1916, 419 (note).  
 Type, *Aphantochroa gularis* GOULD. [Trochilidae.]  
 (Original designation and monotypy.)  
 New name for *Agapeta* Heine, 1863, preoccupied in coleoptera.<sup>3</sup>
- Aguimpia** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 255.  
 Type, *Motacilla aguimp* DUMONT. [Motacillidae.]  
 (Original designation.)  
 (Subgenus of *Motacilla* Linnaeus.)
- Agyrtina**<sup>4</sup> C. CHUBB, Birds Brit. Guiana, I, 1916, 395.  
 Type, *Uranomitra whitelyi* BOUCARD. [Trochilidae.]  
 (Original designation.)
- Alcippornis** H. C. OBERHOLSER, Smithsonian Misc. Colls., 74, No. 2, Sept. 27, 1922, 1.  
 Type, "*Alcippe cinerea* Blyth nec Eyton (= *Hyloterpe brunneicauda* Salvadori)." [Timaliidae.]  
 (Original designation.)  
 New name for *Alcippe* of authors, not Blyth.  
 "Ἀλκιππη, Alcippe; ὄρνις, bird." (Oberholser.)

<sup>3</sup> Refer also to Butler, Ibis, 1926, 338.

<sup>4</sup> New name "for the species classed under *Agyrtia* Reichenbach by Brabourne and Chubb... as we find, upon further research, that Reichenbach proposed *Agyrtia* as a substitute name for *Thaumatias* Bonaparte, which equals *Polytmus* Brisson."

- Alector**<sup>5</sup> B. MERREM, *Avium Rariorum et minus cognitarum Icones et Descriptiones*, fasc. 2, 1786, 40.  
Type, *Craz alector* LINNAEUS. [Cracidae.]  
(Tautonymy.)
- Alterapus** G. M. MATHEWS, *Birds Australia*, VII, Pt. III, August 26, 1918, 264.  
Type, *Chaetura sabini* GRAY. [Micropodidae.]  
(Original designation and monotypy.)
- Amoromyza** C. W. RICHMOND, *Proc. U. S. Nat. Mus.*, 53, No. 2221, Aug. "16"  
(=25), 1917, 593.  
Type, *Merops samoensis* HOMBRON and JACQUINOT. [Meliphagidae.]  
(Original designation and monotypy.)  
New name for *Leptornis* Hombron and Jacquinot, 1845, preoccupied.
- Amoropelia** G. M. MATHEWS, *Austral Avian Record*, IV, No. 6, Aug. 1, 1921, 164.  
Type, *Columba turtur* LINNAEUS. [Claraviidae.]  
(Original designation.)  
(Substitute name for *Turtur* Selby, 1835, not *Turtur* Boddaert, 1783.)
- Anacarbo** A. ROBERTS, *Annals Transvaal Museum*, VIII, Pt. 4, Oct. 30, 1922, 205.  
Type, *Graculus neglectus* WAHLBERG. [Phalacrocoracidae.]  
(Original designation and monotypy.)
- Anacorys** A. ROBERTS, *Annals Transvaal Museum*, VIII, Pt. 4, Oct. 30, 1922, 260.  
Type, *Mirafra africanoides* A. SMITH. [Alaudidae.]  
(Original designation.)  
(Subgenus of *Mirafra* Horsfield.)
- Anomalaetus** A. ROBERTS, *Annals Transvaal Museum*, VIII, Pt. 4, Oct. 30, 1922, 208.  
Type, *Spizaetus ayresii* GURNEY. [Buteonidae.]  
(Monotypy.)
- Anomalanthus** A. ROBERTS, *Annals Transvaal Museum*, VIII, Pt. 4, Oct. 30, 1922, 256.  
Type, *Anthus nicholsoni* SHARPE. [Motacillidae.]  
(Monotypy.)
- Anopetia** E. SIMON, *Notice sur les Travaux Scientifiques*, 1918, 38; *Revue Française d'Orn.*, VI, No. 120 April 7, 1919, 52.  
Type, *Phæthornis gounellei* BOUCARD. [Trochilidae.]  
(Monotypy.)
- Anthophagus** "Lath." J. JENNINGS, *Ornithologia*, ed. 2, 1829, 33, 319, 329. (See Mathews and Iredale, *Austral Avian Record*, IV, 1922, 172, 174.)  
Type, "*A. olivaceus* Lath." (= *Cinnyris affinis* HORSFIELD). [Nectariniidae.]  
(Subsequent designation, Mathews and Iredale, 1922.)
- Antisyma** G. M. MATHEWS, *Birds Australia*, VII, Pt. II, May 15, 1918, 154, 161.  
Type, *Alcedo australasia* VIELLOT. [Alcedinidae.]  
(Original designation and monotypy.)
- Apatelosia** E. SIMON, *Hist. Nat. Trochilidae*, 1921, 170, 361.  
Type, *Homophania lawrencei* BOUCARD. [Trochilidae.]  
(Monotypy.)
- †**Archaeornis** B. PETRONIEVICS, in Petronievics and Woodward, *Proc. Zool. Soc. London*, 1917, Pt. I, April 20, 1917, 5 (note).  
Type, *Archaeopteryx siemensii* DAMES. [Archaeopterygidae.]  
(Monotypy.)

<sup>5</sup>The name *Alector* becomes a synonym of *Craz*. It was proposed by Merrem not as a substitute name for *Craz*, but as a comprehensive genus to include *Craz*, *Penelope*, and *Ortalis*.

- Arctositta** S. A. BUTURLIN, Travaux Soc. Imp. Nat. Pétrograd, XLIV, Livr. 2  
1916, 151, 156, 168.  
Type, *Sitta arctica* BUTURLIN. [Sittidae.]  
(Original designation and monotypy.)
- Arenella** "nom. nov." E. SIMON, Hist. Nat. Trochilidae, 1921, 116, 331.  
Type, *Arena boucardi* Mulsant. [Trochilidae.]  
(Monotypy.)
- New name for *Arena* and *Arinia* Mulsant, 1878.
- Argyroceyx** G. M. MATHEWS, Birds Australia, VII, Pt. I, March 4, 1918, 97.  
Type, *Ceyx argentata* TWEEDDALE. [Alcedinidae.]  
(Original designation.)
- Athenoptera** Hutton, MS., in A. O. HUME, My Scrap Book (Rough Notes Indian Orn.), Pt. I, No. 2, 1870, 392.  
Type, *Ephialtes spilocephalus* BLYTH (or *E. huttoni* HUME). [Bubonidae.]  
(Monotypy.)
- Atolmodytes** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 255.  
Type, *Motacilla clara* SHARPE. [Motacillidae.]  
(Original designation and monotypy.)  
(Subgenus of *Motacilla* Linnaeus.)
- Ayresillas** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 226.  
Type, *Phyllastrephus flavostriatus* SHARPE. [Pycnonotidae.]  
(Original designation and monotypy.)
- Bangsia** T. E. PENARD, Auk, XXXVI, No. 4, Oct., 1919, 539.  
Type, *Buthraupis arcae caeruleigularis* CHERRIE. [Tanagridae.]  
(Original designation.)  
For Outram Bangs (Penard.)
- Baptothorax** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 251.  
Type, *Certhia gutturalis* LINNAEUS. [Nectariniidae.]  
(Monotypy.)  
(Subgenus of *Chalcomitra* Reichenbach.)
- Barbaculus** F. P. JAROCKI, Zoologia, II, 1821, 33 (see Mathews and Iredale;  
Austral Avian Record, III, 1918, 143).  
Type, *Bucco calcaratus* LATHAM. [Bucconidae.]  
(Monotypy.)
- Baryrhynchus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 214.  
Type, *Buceros cristatus* RÜPPELL. [Bucerotidae.]  
(Monotypy.)
- Berneyornis** G. M. MATHEWS, Birds Australia, V, Pt. III, May 23, 1916, 305,  
Pt. IV, 355.  
Type, *Athene ? strenua* GOULD. [Bubonidae.]  
(Original designation and monotypy.)  
For Frederic L. Berney. (Mathews.)
- Bombornis** H. C. OBERHOLSER, Auk, XXXVII, No. 2, April 1920, 295.  
Type, *Trochilus curvierii* DELATRE and BOURCIER. [Trochilidae.]  
(Original designation.)  
New name for *Phaeochroa* Gould, 1861, not *Phaeochrous* Laporte, 1840.  
"Βόμβος, bombus; ὄρνις, avis." (Oberholser.)
- †**Botaurites** L. AMMON, Abhandl. nat. Ver. Regensburg, XII, 1918, 32.<sup>6</sup>  
Type, *Botaurites avitus* AMMON. [Ardeidae?]  
(Monotypy?)

<sup>6</sup> I have not seen this reference.

**Brabournea** C. CHUBB, Birds Brit. Guiana, I, 1916, 394.

Type, *Thaumasius taczanowskii* SCLATER.

[*Trochilidae*.]

(Original designation and monotypy.)

New name for *Thaumasius* P. L. Sclater (preoccupied).<sup>7</sup>

**Brubru** F. LAFRESNAYE, Essai d'une nouvelle manière de grouper les genres et les espèces de l'ordre des Passereaux, "1838," 7, 9.

Type, "Brubru" of Levaillant [= *Lanius brubru* LATHAM].

[*Laniidae*.]

(Tautonymy.)

**Buccanodon** "Verr. 1855" G. R. GRAY, A list of Genera and Subgenera of Birds,<sup>8</sup> 1855, errata.

Type, "Buccanodon formosus, Verr." (= *Barbatula formosa* VERREAUX).

(Monotypy.)

[*Capitonidae*.]

**Buphagoides** J. P. CHAPIN, Amer. Mus. Novitates, No. 17, Sept. 16, 1921, 4.

Type, *Tanagra erythroryncha* STANLEY.

[*Sturnidae*.]

(Monotypy.)

(Subgenus of *Buphagus* Brisson.)

**Burhinops** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 203.

Type, *Oedicnemus capensis* LICHTENSTEIN.

[*Oedicnemidae*.]

(Original designation and monotypy.)

**Butor** T. FORSTER, Pocket Encycl. Nat. Phenomena, 1827, 417. (See Mathews, Austral Avian Record, IV, 1921, 135).

Type, *Butor stellaris* or "common Bittern."

[*Ardeidae*.]

(Monotypy.)

**Butor** W. SWAINSON, in Murray, Encycl. Geography, 1834, 1384, fig. 958.

Type, *Butor minor* SWAINSON = *Ardea lentiginosa* MONTAGU.

(Monotypy.)

[*Ardeidae*.]

**Caffranthus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 256.

Type, *Anthus caffer* SUNDEVALL.

[*Motacillidae*.]

(Original designation and monotypy.)

**Caffrapus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 217.

Type, *Cypselus caffer* LICHTENSTEIN.

[*Micropodidae*.]

(Original designation and monotypy.)

**Caffropasser** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 261.

Type, *Loxia melanura* P. L. S. MÜLLER.

[*Fringillidae*.]

(Monotypy.)

(Subgenus of *Passer* Brisson.)

**Caffronis** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 232.

Type, "the typical species with dark legs and feet."<sup>9</sup>

[*Turdidae*.]

(New name for *Cossypha*.)

**Cafirillas** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 234.

Type, *Bradypterus barratti* SHARPE.

[*Sylviidae*.]

(Monotypy.)

<sup>7</sup> Refer also to Butler, Ibis, 1926, 338.

<sup>8</sup> This is apparently Gray's "Catalogue of the Genera and Subgenera of Birds", of 1855, "Printed by order of the Trustees", with a new title page as above, "Printed by Taylor and Francis, Red Lion Court, Fleet Street, 1855," with a sheet of errata, containing about thirty additional generic names, with their type designations, and including the above additional genus. It is possible the name *Buccanodon* first occurs in the publication "Ateneo Italiano", a scarce journal that was issued in Paris at that time.

<sup>9</sup> W. L. Sclater, Zool. Record, Aves, vol. lix, for 1922, p. 61, gives *Motacilla caffa* Linnaeus, as the type.

- Callocorydon** G. M. MATHEWS, *Birds Australia*, VI, Pt. II, Feb. 6, 1917, 150.  
 Type, *Psittacus fimbriatus* GRANT (= *P. galeatus* LATHAM, preoccupied).  
 (Original designation and monotypy.) [Kakatoëidae.]  
 New name for *Callocephalon* Lesson, 1837, not *Calocephalus* F. Cuvier, 1826.
- Calloprocnias** C. CHUBB, *Bull. Brit. Orn. Club*, XL, No. CCXLIX, March 31, 1920, 107.  
 Type, *Chasmorhynchus tricarunculatus* J. and E. VERREAUX. [Cotingidae.]  
 (Original designation and monotypy.)
- Calophoneus** A. ROBERTS, *Annals Transvaal Museum*, VIII, Pt. 4, Oct. 30, 1922, 247.  
 Type, *Lanius quadricolor* CASSIN. [Laniidae.]  
 (Original designation and monotypy.)
- Calopteroles** A. ROBERTS, *Annals Transvaal Museum*, VIII, Pt. 4, Oct. 30, 1922, 195.  
 Type, *Tetrao variegatus* BURCHELL = *Pterocles (Eremialector) burchelli* W. L. SCLATER. [Pteroclididae.]  
 (Original designation and monotypy.)
- Campicoloides** A. ROBERTS, *Annals Transvaal Museum*, VIII, Pt. 4, Oct. 30, 1922, 229.  
 Type, *Saxicola bifasciata* TEMMINCK. [Turdidae.]  
 (Monotypy.)
- Capella** J. S. T. FRENZEL, *Beschr. Vögel und ihrer Eyer in der Gegend Wittenberg*, 1801, 58. (See Mathews and Iredale, *Austral Avian Record*, IV, 1920, 131.)  
 Type, *Scolopax coelestis* FRENZEL. [Scolopacidae.]  
 (Monotypy.)
- Cardinalis** ex Cuv., F. P. JAROCKI, *Zoologia*, II, 1821, 133. (See Mathews and Iredale, *Austral Avian Record*, III, 1918, 144.)  
 Type, *Tanagra rubra* "GL." (= LINNEAUS, 1766). [Tanagridae.]  
 (Monotypy.)
- Cassinaëtus** W. L. SCLATER, *Bull. Brit. Orn. Club*, XLII, No. CCLXVI, Feb. 25, 1922, 76.  
 Type, *Limnaëtus africanus* CASSIN. [Buteonidae.]  
 (Original designation and monotypy.)
- Caturates** T. FORSTER, *Pocket Encycl. Nat. Phenomena*, 1827, 419. (See Mathews and Iredale, *Austral Avian Record*, IV, 1921, 162-4.)  
 Type, *Caturates maximus* FORSTER (= *Larus maximus* LEACH = *Larus marinus* LINNAEUS) is the first of four species. [Laridae.]
- Cecilia** G. M. MATHEWS, *Birds Australia*, VII, Pt. II, May 15, 1918, 153, 160.  
 Type, *Alcedo pileata* BODDAERT. [Alcedinidae.]  
 (Original designation and monotypy.)
- Cecrastes** A. ROBERTS, *Annals Transvaal Museum*, VIII, Pt. 4, Oct. 30, 1922, 219.  
 Type, *Cuculus jacobinus* BODDAERT. [Cuculidae.]  
 (Monotypy.)  
 (Subgenus of *Melanolophus* Roberts.)
- Celebesia** J. H. RILEY, *Proc. Biol. Soc. Washington*, 31, Dec. 30, 1918, 158.  
 Type, *Celebesia abbotti* RILEY. [Campephagidae.]  
 (Original designation and monotypy.)
- Celuro** F. P. JAROCKI, *Zoologia*, II, 1821, 156. (See Mathews and Iredale, *Austral Avian Record*, III, 1918, 143.)  
 Type, "Podarge Bulock de la Nouvelle Hollande" (= *Caprimulgus strigoides* LATHAM). [Podargidae.]  
 (Monotypy.)

- Ceycalcyon G. M. MATHEWS, Birds Australia, VII, Pt. I, March 4, 1918, 97.  
Type, *Ceyx cyanopectus* LAFRESNAYE. [Alcedinidae.]  
(Original designation.)
- Ceycoides G. M. MATHEWS, Birds Australia, VII, Pt. I, March 4, 1918, 98.  
Type, *Alcedo madagascariensis* LINNAEUS. [Alcedinidae.]  
(Original designation and monotypy.)
- Chæneirhynchus F. P. JAROCKI, Zoologia, II, 1821, 17. (See Mathews and Iredale, Austral Avian Record, III, 1918, 143.)  
Type, *Psittacus aterrimus* GMELIN. [Kakatoëidae.]  
(Monotypy.)
- Chæturellus G. M. MATHEWS, Birds Australia, VII, Pt. III, Aug. 26, 1918, 267.  
Type, *Hirundo rutila* VIEILLOT. [Micropodidae.]  
(Original designation.)
- Chapmania A. de M. RIBEIRO, Revista Museu Paulista, XII, "1920" (1922?), 10, 65.  
Type, *Psittacus barrabandi* KUHL. [Psittacidae.]  
(Original designation and monotypy.)
- Cheimonornis A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 224.  
Type, *Hirundo paludicola* VIEILLOT. [Hirundinidae.]  
(Original designation.)
- Chelicutona G. M. MATHEWS, Birds Australia, VII, Pt. II, May 15, 1918, 150, 160.  
Type, *Alcedo albiventris* SCOPOLI. [Alcedinidae.]  
(Original designation and monotypy.)
- Chenogeranus T. BROWN, Rept. Council Manchester Nat. Hist. Soc., Jan., 1842, 4.  
(See Mathews, Austral Avian Record, IV, 1922, 166.)  
Type, *Chenogeranus australis* BROWN, a *nomen nudum* (but=*Anas semipalmata* LATHAM, according to Mathews). [Anatidae.]
- Chionomesa "nom. nov." E. SIMON, Hist. Nat. Trochilidae, 1921, 104, 320.  
Type, *Ornismya lactea* LESSON (first species mentioned). [Trochilidae.]  
(New name for *Thaumantias* Bonaparte?)
- Chlorindus L. NAVÁS, Anales Facultad Ciencias Zaragoza, I, No. 2, June, 1907, 127.  
Type, *Fringilla serinus* LINNAEUS. [Fringillidae.]  
(Monotypy.)  
New name for *Serinus* Koch.  
"χλωρός, verde." (Navás.)
- Chloropetella A. ROBERTS, Annals Transvaal Museum, VI, Pt. 1, June 28, 1917, 1.  
Type, *Chloropetella suahelica* ROBERTS. [Muscicapidae.]  
(Original designation and monotypy.)
- Chloropogon E. SIMON, Notice sur les Travaux Scientifiques, 1918, 39.<sup>10</sup>  
Type, *Trochilus ruficeps* GOULD. [Trochilidae.]  
(Monotypy.)
- Chlorostola<sup>11</sup> E. SIMON, Notice sur les Travaux Scientifiques, 1918, 38.  
Type, *Trochilus glaucopsis* GMELIN. [Trochilidae.]  
(Monotypy.)

<sup>10</sup> In Hist. Nat. Trochilidae, 1921, p. 383, he says it is preoccupied, and that *Selatopogon* is a substitute name for it ("*Selatopogon* substitué à *Chloropogon*"), but, at the place where *Selatopogon* is proposed, it is stated to be a "nov. gen."

<sup>11</sup> Preoccupied, and renamed *Chlorurania* (Simon, Hist. Nat. Trochilidae, 1921, 302).

**Chlorurania** "nov. gen." E. SIMON, Revue Française d'Orn., VI, No. 120, April 7, 1919, 53.

Type, *Trochilus glaucopsis* Gmelin.

[Trochilidae.]

(Original designation and monotypy.)

(See *Chlorostola*.)

**Chlorurisca** E. SIMON, Hist. Nat. Trochilidae, 1921, 129, 340.

Type, *Hypuroptila isaurae* Gould.

[Trochilidae.]

(Original designation.)

(Not indicated as new here.)

**Cirropicus** E. STRESEMANN, Archiv für Naturgesch., 87 Jahrg., Abt. A, Heft 7, June, 1921, 71.

Type, *Picus chlorolophus* Vieillot.

[Picidae.]

(Original designation.)

"Als cirrus, eigentlich "Fränse", wird von Plinius (nat. hist. XI.) der Schopf des Schwarzspechtes (*Dryocopus martius* [L.]) bezeichnet." (Stresemann.)

**Clarkona** G. M. MATHEWS, Birds Australia, VI, Pt. V, Sept. 11, 1917, 391.

Type, *Psephotus varius* Clark.

[Psittacidae.]

(Original designation and monotypy.)

Subgenus of *Psephotus* Gould.

**Cnemathraupis** T. E. PENARD, Auk, XXXVI, No. 4, Oct., 1919, 538.

Type, *Tanagra eximia* Boissonneau.

[Tanagridae.]

(Original designation.)

**Cnemoscopus** O. BANGS and T. E. PENARD, Bull. Mus. Comp. Zool., LXIII, No. 2, June, 1919, 38.

Type, *Arremon rubrirostris* Lafresnaye.

[Tanagridae.]

(Original designation and monotypy.)

**Coeliola** E. SIMON, Notice sur les Travaux Scientifiques, 1918, 39.

Type, *Ornismya coeligena* Lesson.

[Trochilidae.]

(Monotypy.)

(See *Pseudocaeligena* Simon.)

**Colletoptera** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 217.

Type, *Cypselus affinis* Gray.

[Micropodidae.]

(Original designation and monotypy.)

**Colonocichla** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 228.

Type, *Monticola brevipes* Strickland and Sclater = *Petrocincla brevipes* G. Waterhouse.

(Original designation.)

[Turdidae.]

(Subgenus of *Petrophila*.)

**Cometornis**<sup>12</sup> O. BANGS and T. E. Penard, Bull. Mus. Comp. Zool., LXIV, No. 4, Jan., 1921, 373.

Type, *Todirostrum squamaecrista* Lafresnaye.

[Tyrannidae.]

(Original designation.)

**Compsoenas** J. H. RILEY, Proc. Biol. Soc. Washington, 34, March 31, 1921, 51.

Type, *Columba radiata* Quoy and Gaimard.

[Treronidae.]

(Original designation.)

<sup>12</sup> See Bangs and Penard, Proc. Biol. Soc. Wash., 34, 1921, 78, where it is found *Cometornis* becomes a synonym of *Lophotriccus* Berlepsch.



- Cophixus* H. C. OBERHOLSER, Journ. Washington Acad. Sci., IX, No. 1, Jan. 4, 1919, 15.  
 Type, *Spizizos semitorques* SWINHOE. [Pycnonotidae.]<sup>13</sup>  
 (Original designation.)  
 "κωφός, obtusus; ixus=ἰξός, viscum." (Oberholser.)
- Coracornis* J. H. RILEY, Proc. Biol. Soc. Washington, 31, Dec. 30, 1918, 157.  
 Type, *Coracornis raveni* RILEY. [Laniidae.]  
 (Original designation and monotypy.)  
 "Named in honor of H. C. Raven." (Riley).
- Cormobates* G. M. MATHEWS, Austral Avian Record, V, No. 1, July 17, 1922, 6.  
 Type, *Certhia leucophæa* LATHAM. [Certhiidae.]  
 (Original designation.)
- Cosmorhhipis*<sup>14</sup> E. SIMON, Notice sur les Travaux Scientifiques, 1918, 38.  
 Type, *Lophornis pavoninus* SALVIN and GODMAN. [Trochilidae.]  
 (Monotypy.)
- Cranellus* R. TOBIAS, Abh. nat. Ges. Görlitz, IV, Heft i, 1844, 60. (See Mathews and Iredale, Austral Avian Record, IV, 1921, 151.)  
 Type, *Charadrius spinosus* LINNAEUS. [Charadriidae.]  
 (Monotypy.)
- Cranobrontes* J. H. RILEY, Proc. Biol. Soc. Washington, 34, March 31, 1921, 52.  
 Type, *Buceros leucocephalus* VIEILLOT. [Bucerotidae.]  
 (Original designation.)
- Crinifer* F. P. JAROCKI, Zoologia, II, 1821, 181. (See Mathews and Iredale, Austral Avian Record, III, 1918, 143.)  
 Type, *Phasianus africanus* LATHAM=*Falco piscator* BODDAERT. [Musophagidae.]  
 (Monotypy.)
- Cromba* F. P. JAROCKI, Zoologia, II, 1821, 42. (See Mathews and Iredale, Austral Avian Record, III, 1918, 143.)  
 Type, *Cuculus afer* GMELIN. [Leptosomatidae.]  
 (Monotypy.)
- Crotema* A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 216.  
 Type, *Caprimulgus fossei* HARTLAUB. [Caprimulgidae.]  
 (Monotypy.)
- Croteoptera* A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 260.  
 Type, *Alauda apiata* VIEILLOT. [Alaudidae.]  
 (Original designation.)  
 (New name for *Corypha* Gray, 1840, not *Coryphe* in Coleoptera.)
- Cruopsitta* G. M. MATHEWS, Birds Australia, VI, Pt. I, Nov. 22, 1916, 64.  
 Type, *Cyclopsittacus edwardsii* OUSTALET. [Cyclopsittacidae.]  
 (Original designation.)
- Crypturornis* H. C. OBERHOLSER, Proc. Biol. Soc. Washington, 35, March 20, 1922, 73.  
 Type, *Tetrao cinereus* GMELIN. [Tinamidae.]  
 (Original designation.)  
 (New name for *Crypturus* authors, not Illiger, which=*Tinamus*.)  
 "κρυπτός, occultus, οὐρά, cauda ὄρνις, avis." (Oberholser.)

<sup>13</sup> With *Spizizos*, placed in a new family, Spizixidae.<sup>14</sup> Spelt *Cosmorhhipis* in Revue Française d'Orn., VI, No. 120, April 7, 1919, 52.

**Curzon**<sup>15</sup> "E. R." [=K. L.] SKINNER, A List of the Birds of British India, 1905, 1, 6.

New Name for *Gypsophila* OATES, preoccupied "in botany." [*Timaliidae*.]

Named for "Lord Curzon, then Viceroy of India." (Skinner, M.S.)

**Cuvieria** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 210.

Type, *Falco cuvieri* A. SMITH. [*Falconidae*.]  
(Monotypy.)

**Cyanoceyx** G. M. MATHEWS, Birds Australia, VII, Pt. I, March 4, 1918, 96.

Type, *Ceyx lepida* TEMMINCK. [*Alcedinidae*.]  
(Original designation.)

(Spelt "*Cyanonyx*" in review in Ibis, 1918, 507.)

**Cyanolampis** E. SIMON, Notice sur les Travaux Scientifiques, 1918, 38; Revue Française d'Orn., VI, No. 120, April 7, 1919, 52.

Type, *Trochilus doubledayi* BOURCIER. [*Trochilidae*.]  
(Monotypy.)

**Cyanositta** S. A. BUTURLIN, Travaux Soc. Imp. Nat. Pétrograd, XLIV, Livr. 2, 1916, 149, 156, 167.

Type, *Dendrophila corallipes* SHARPE. [*Sittidae*.]  
(Original designation.)

**Dacelalcyon** G. M. MATHEWS, Birds Australia, VII, Pt. II, May 15, 1918, 117.

Type, *Monachalcyon cyanocephalus* (of Brit. Mus. Cat., XVII, 295) =  
*Dacelalcyon confusus* MATHEWS. [*Alcedinidae*.]  
(Monotypy.)

**Demelioteucus**<sup>16</sup> H. STEPELMANN and F. SCHULZ, Boletín Acad. Nac. Ciencias en Córdoba, X, Entrega 4, 1890, 399.

Type, "*Demelioteucus badius* (Vieill.)" = *Agelaius badius* VIEILLOT. [*Icteridae*.]  
(Monotypy.)

**Dendrocinclopa** C. CHUBB, Bull. Brit. Orn. Club, XL, No. CCXLIX, March 31, 1920, 107.

Type, *Dendrocinclopa longicauda guianensis* CHUBB. [*Dendrocolaptidae*.]  
(Original designation and monotypy.)

**Dendroperdix** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 194.

Type, *Perdix sephaena* A. SMITH. [*Phasianidae*.]  
(Original designation.)

**Dendrospiza** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 262.

Type, *Crithagra scotops* SUNDEVALL. [*Fringillidae*.]  
(Original designation and monotypy.)

(Subgenus of *Serinus* Koch.)

**Devisornis** G. M. MATHEWS, Austral Avian Record, III, No. 4, July 21, 1917, 90.

Type, *Malurus alboscapulatus* MEYER. [*Sylviidae*.]  
(Original designation and monotypy.)

**Dichropogon** C. CHUBB, Annals and Mag. Nat. Hist., ser. 9, II, No. 7, July, 1918, 124.

Type, *Hypocnemis poecilonota* CABANIS. [*Formicariidae*.]  
(Monotypy.)

<sup>15</sup> Emended to *Cursonia* by Stuart Baker, Journ. Bombay Nat. Hist. Soc., XXVII, No. 3, 1921, p. 454.

<sup>16</sup> The name *Demelioteucus* is not designated as new here, and the probabilities are that it was instituted at an earlier date, possibly by some other author. The name was called to my attention by Dr. Herbert Friedmann, of Cambridge, Mass

Dilazula G. M. MATHEWS, Birds Australia, VII, Pt. II, May 15, 1918, 155, 160.

Type, *Halcyon nigrocyanæa* WALLACE. [Alcedinidae.]  
(Original designation.)

Dilazulena G. M. MATHEWS, Birds Australia, VII, Pt. II, May 15, 1918, 155.

Type, *Halcyon winchelli* SHARPE. [Alcedinidae.]  
(Original designation and monotypy.)

(Subgenus of *Halcyon*?)

Diopezus J. H. RILEY, Proc. Biol. Soc. Washington, 34, March 31, 1921, 52.

Type, *Phlegenas tristigmata* BONAPARTE. [Claraviidae.]  
(Original designation and monotypy.)

Dipardalotus G. M. MATHEWS, Austral Avian Record, V, No. 1, July 17, 1922, 7.

Type, *Pardalotus rubricatus yorkei* MATHEWS. [Dicaeidae.]  
(Original designation and monotypy.)

Diplophoneus A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 245.

Type, *Lanius ferrugineus* GMELIN. [Lanidae.]  
(Original designation and monotypy.)

(Subgenus of *Laniarius*.)

Dryodytops A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 238.

Type, *Sylvia lugubris* RÜPPEL. [Sylviidae.]  
(Original designation and monotypy.)

(Subgenus of *Dryodyta* Sundevall.)

Dumcanula C. CHUBB, Annals and Mag. Nat. Hist., ser. 9, VII, No. 38, Feb., 1921, 193.

Type, *Catamenia homochroa* SCLATER. [Fringillidae.]  
(Original designation.)

Dysmorodrepanis R. C. L. PERKINS, Annals and Mag. Nat. Hist., ser. 9, III, No. 15, March, 1919, 250.

Type, *Dysmorodrepanis munroi* PERKINS. [Drepanididae.]  
(Monotypy.)

Edquista G. M. MATHEWS, Birds Australia, VII, Pt. II, May 15, 1918, 198.

Type, *Tanysiptera carolinae* SCHLEGEL. [Alcedinidae.]  
(Original designation and monotypy.)

(Subgenus of *Tanysiptera*.)

Eider F. P. JAROCKI, Spis Ptaków, 1819, 62.

Type, *Anas mollissima* GMELIN. [Anatidae.]  
(Monotypy.)

Epicypselus A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 217.

Type, *Cypselus horus* HEUGLIN. [Micropodidae.]  
(Original designation and monotypy.)

Erannornis H. C. OBERHOLSER, Auk, XXXVII, No. 2, April, 1920, 302.

Type, *Myiagra longicauda* SWAINSON. [Muscicapidae.]  
(Original designation.)

NEW. New name for *Elminia* Bonaparte, 1854, not *Elminius* King, 1831.

"ἐραννός, delicatus; ὄρνις, avis." (Oberholser.)

Eremialector W. L. SCLATER, Bull. Brit. Orn. Club, XLII, No. CCLXVI, Feb. 25, 1922, 74.

Type, *Tetrao orientalis* LINNAEUS. [Pteroclididae.]  
(Original designation.)

"ἐρημία, a desert, and ἀλεκτωρ, a cock." (Selater.)

- Eremicinyris** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 252.  
 Type, *Cinnyris fuscus* VIEILLOT. [Nectariniidae.]  
 (Original designation and monotypy.)
- Eremomeloides** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 235.  
 Type, *Dryodromas albigularis* HARTLAUB and FINSCH. [Sylviidae.]  
 (Monotypy.)
- Eressornis** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 248.  
 Type, *Prionops reitzii* Wahlberg. [Prionopidae.]  
 (Original designation and monotypy.)
- Eusægotheles** G. M. MATHEWS, Birds Australia, VII, Pt. I, March 4, 1918, 52.  
 Type, *Batrachostomus psilopterus* GRAY=*B. crinifrons* BONAPARTE.  
 (Original designation and monotypy.) [Podargidae.]
- Eucacatua** G. M. MATHEWS, Birds Australia, VI, Pt. II, Feb. 6, 1917, 169.  
 Type, *Psittacus galeritus* LATHAM. [Kakatoëidae.]  
 (Original designation.)  
 New name for *Kakatoë* Cuvier?
- Eucinnyris** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 253.  
 Type, *Cinnyris leucogaster* VIEILLOT. [Nectariniidae.]  
 (Original designation.)
- Eucoracias** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 213.  
 Type, *Coracias mosambicus* DRESSER. [Coraciidae.]  
 (Original designation and monotypy.)
- Euolor** G. M. MATHEWS and T. IREDALE, Austral Avian Record, III, No. 5, Dec. 28, 1917, 117.  
 Type, *Anas olor* GMELIN. [Anatidae.]  
 (Original designation and monotypy.)
- Euphilydor** C. B. CORY, Auk, XXXVI, No. 2, April, 1919, 273.  
 Type, *Philydor lichtensteini* CABANIS and HEINE. [Furnariidae.]  
 (Original designation.)  
 Subgenus (of *Philydor* Spix).
- Euploceus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 271.  
 Type, *Oriolus capensis* LINNAEUS. [Ploceidae.]  
 (Original designation.)  
 (Subgenus of *Hyphantornis*, of authors, not of Gray, 1844.)
- Eupsittacula** "Bp." A. de M. RIBEIRO, Revista Museu Paulista, XII, "1920" (1922?), 9, 28.  
 Type, *Psittacus canicularis* LINNAEUS. [Psittacidae.]  
 (Original designation.)  
 (= *Eupsittula* Bonaparte, and a lapsus for it.)
- Eupsittacus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 212.  
 Type, *Pionus guillemi* JARDINE. [Psittacidae.]  
 (Original designation and monotypy.)  
 (Subgenus of *Poicephalus*.)
- Eusiptornoides** C. B. CORY, Proc. Biol. Soc. Washington, 32, Sept. 30, 1919, 150.  
 Type, *Synallaxis anthoides* KING. [Furnariidae.]  
 (Original designation.)  
 Subgenus of *Siptornoides* Cory.
- Eximinius** G. M. MATHEWS, Birds Australia, VII, Pt. III, August 26, 1918, 235.  
 Type, *Caprimulgus eximius* TEMMINCK. [Caprimulgidae.]  
 (Original designation and monotypy.)

- Ficaria** T. FORSTER, Pocket Encycl. Nat. Phenomena, 1827, 411. (See Mathews and Iredale, Austral Avian Record, IV, 1921, 162-4.)  
Type, *Ficaria hippolais* or "Lesser Petty-chaps" (first species mentioned). [Sylviidae.]
- †**Fontinalis** L. LESQUEREUX, Report U. S. Geol. Surv. Terr., VIII, 1883, 135, pl. 21, fig. 9.  
Type, *Fontinalis pristina* LESQUEREUX.<sup>17</sup> [Incertae sedis.]  
(Monotypy.)
- Frederickena** C. CHUBB, Annals and Mag. Nat. Hist., ser. 9, II, No. 7, July, 1918, 123.  
Type, *Thamnophilus viridis* VIEILLOT. [Formicariidae.]  
(Original designation and monotypy.)
- Gennæodryas** G. M. MATHEWS, Birds Australia, VIII, Pt. 4, Oct. 13, 1920, 186.  
Type, *Eopsaltria placens* RAMSAY. [Muscicapidae.]  
(Original designation and monotypy.)
- †**Gigantornis** C. W. ANDREWS, Abstract Proc. Zool. Soc. London, No. 158, May 30, 1916, 30; Proc. Zool. Soc. London, 1916, Pt. III, Aug. 30, 1916, 519-523.  
Type, *Gigantornis eaglesomei* ANDREWS. [Incertae sedis.<sup>18</sup>]  
(Monotypy.)
- Glaucestrilda** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 268.  
Type, *Estrilda incana* SUNDEVALL. [Ploceidae.]  
(Original designation and monotypy.)
- Glaucomorpha** H. C. OBERHOLSER, Journ. Washington Acad. Sci., VII, No. 17, Oct. 19, 1917, 539.  
Type, *Muscicapa cyanea* BEBBIE. [Pycnonotidae.<sup>19</sup>]  
(Original designation.)
- Gnaphocercus** E. SIMON, Notice sur les Travaux Scientifiques, 1918, 39; Revue Française d'Orn., VI, No. 120, April 7, 1919, 53.  
Type, *Trochilus adela* d'ORBIGNY and LAFRESNAYE. [Trochilidae.]  
(Monotypy.)
- Graculaea** F. P. JAROCKI, Zoologia, II, 1821, 126. (See Mathews and Iredale, Austral Avian Record, III, 1918, 143.)  
Type, "*Gracula tristis* Lath." = *Paradisaea tristis* LINNAEUS. [Graculidae.]  
(Monotypy.)
- Grillia** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 220.  
Type, *Centropus grilli* HARTLAUB. [Cuculidae.]  
(Original designation and monotypy.)
- Gunningia** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 253.  
Type, *Anthreptes reichenowi* GUNNING. [Nectariniidae.]  
(Monotypy.)
- For Dr. J. W. B. Gunning. (Roberts.)
- Gymnopsittacus** A. de M. RIBEIRO, Revista Museu Paulista, XII, "1920" (1922?), 9, 26, 79.  
Type, *Conurus weddelli* DEVILLE. [Psittacidae.]  
(Original designation.)

<sup>17</sup> Based on fragment of a feather, and first described as a plant. (See Wetmore, Bull. Mus. Comp. Zool., LXVII, No. 2, 1925, p. 184, and Knowlton, Proc. U. S. Nat. Mus., vol. 51, 1916, p. 245.)

<sup>18</sup> Allied to the Tubinares and Steganopodes.

<sup>19</sup> Irenidae, according to the author.

**Habia** "Vieillot" E. BLYTH, in Cuvier, Animal Kingdom, 1840, 184.

Type, *Tanagra flammiceps* WIED. [Tanagridae.]

(Subsequent designation, Oberholser, 1922.)

(Replaces *Phoenicotherapis* Cabanis, 1851.)

**Haganopsornis** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 225.

Type, *Bradornis infuscatus* A. SMITH. [Muscicapidae.]

(Original designation and monotypy.)

**Halcyonops** G. M. MATHEWS, Birds Australia, VII, Pt. II, May 15, 1918, 149, 160.

Type, *Halcyon dryas* HARTLAUB. [Alcedinidae.]

(Original designation.)

(Subgenus of *Halcyon*.)

**Hamirostra** T. BROWN, Illustr. Genera Birds, Pt. VIII, April 3, 1846,—. (See Mathews, Austral Avian Record, IV, 1922, 167.)

Type, *Hamirostra montana* BROWN (= *Buteo melanosternon* GOULD).

[Buteonidae.]

(Monotypy.)

**Hapalocrex** R. RIDGWAY, Smithsonian Misc. Colls., 72, No. 4, Dec. 6, 1920, 3.

Type, *Rallus flaviventris* BODDAERT. [Rallidae.]

(Original designation and monotypy.)

"ἀπαλός, delicate; κρέξ, a crane." (Ridgway.)

**Haplophædia** E. SIMON, Notice sur les Travaux Scientifiques, 1918, 39; Revue Française d'Orn., VI, No. 120, April 7, 1919, 53.

Type, *Trochilus aureliae* BOURCIER and Mulsant. [Trochilidae.]

(Monotypy.)

**Haplornis** A. WETMORE, in Townsend and Wetmore, Bull. Mus. Comp. Zool., LXIII, No. 4, August, 1919, 201.

Type, *Rhipidura lessoni* GRAY.

[Muscicapidae.]

(Monotypy and also subsequent designation, Stone, 1920.)

New name for *Muscylva* authors, not Lesson, 1831.

**Haringtonia** G. M. MATHEWS and T. IREDALE, Austral Avian Record, III, No. 5, Dec. 28, 1917, 124.

Type, *Hypsipetes psaroides* VIGORS.

[Pycnonotidae.]

(Original designation.)

New name for *Hypsipetes* Vigors, 1831, not *Ypsipetes* Stephens, 1829.

**Helicolestes** O. BANGS and T. E. PENARD, Bull. Mus. Comp. Zool., LXII, No. 2, April, 1918, 38.

Type, *Falco hamatus* ILLIGER.

[Buteonidae.]

(Original designation and monotypy.)

**Hemimacronyx** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 258.

Type, *Anthus chloris* SUNDEVALL.

[Motacillidae.]

(Original designation and monotypy.)

**Hemipsittacus** A. de M. RIBEIRO, Revista Museu Paulista, XII, "1920" (1922?), 7, 16.

Type, *Psittacus severus* LINNAEUS.

[Psittacidae.]

(Original designation and monotypy.)

†**Hermosiornis** C. ROVERETO, Anales Mus. Nac. Buenos Aires, XXV, 1914, 163, Type, *Mesembriornis milne-edwardsi* MORENO and MERCERAT.

[*"Hermosiornidae."*]

(Original designation.)

**Heteroglaucis** E. SIMON, Notice sur les Travaux Scientifiques, 1918, 38; Revue Française d'Orn., VI, No. 120, April 7, 1919, 52.

Type, *Trochilus ruckeri* BOURCIER. [Trochilidae.]  
(Monotypy.)

†**Heterorhea** C. ROVERETO, Anales Mus. Nac. Buenos Aires, XXV, 1914, 160.

Type, *Heterorhea dabbeni* ROVERETO. [Rheidae.]  
(Monotypy.)

**Homositta** S. A. BUTURLIN, Travaux Soc. Imp. Nat. Pétersbourg, XLIV, Livr. 2, 1916, 152, 156, 169.

Type, *Sitta castaneiventris* FRANKLIN. [Sittidae.]  
(Original designation.)

(Subgenus of *Sitta* Linnaeus.)

**Horizonetta** H. C. OBERHOLSER, Proc. Biol. Soc. Washington, 30, May 23, 1917, 119.

Type, *Anas laysanensis* ROTHSCHILD. [Anatidae.]  
(Original designation and monotypy.)

"ὄψις, limbo; ὄψις, anas." (Oberholser).

**Hygrobates** M. H. C. LICHTEINSTEIN, Verz. Sammlung neuholländischer Naturalien, 1837, 6.

Type, *Anas lobatus* "Lath." (=SHAW). [Anatidae.]  
(Monotypy.)

(=emendation of *Hydrobates* Temminck, 1826, but not indicated as new here.)

**Hyloaeden** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 232.

Type, *Muscicapa dichroa* GMELIN. [Turdidae.]  
(Original designation.)

**Hylocryptus** F. M. CHAPMAN, Proc. Biol. Soc. Washington, 32, Dec. 31, 1919, 258.

Type, *Hylocryptus erythrocephalus* CHAPMAN. [Furnariidae.]  
(Original designation and monotypy.)

**Hypochionis** E. SIMON, Notice sur les Travaux Scientifiques, 1918, 38; Revue Française d'Orn., VI, No. 120, April 7, 1919, 53.

Type, *Ornismya cyanocephalus* LESSON. [Trochilidae.]  
(Monotypy.)

**Hypocnemoides** O. BANGS and T. E. PENARD, Bull. Mus. Comp. Zool., LXII, No. 2, April, 1918, 69.

Type, *Hypocnemis melanopogon* SCLATER. [Formicariidae.]  
(Original designation and monotypy.)

**Hyposyma** G. M. MATHEWS, Birds Australia, VII, Pt. II, May 15, 1918, 154, 161.

Type, *Halcyon cinnamomina* SWAINSON. [Alcedinidae.]  
(Original designation and monotypy.)

**Idiespiza** W. E. C. TODD, Proc. Biol. Soc. Washington, 30, July 27, 1917, 127.

Type, *Linaria inornata* LAFRESNAYE. [Fringillidae.]  
(Original designation and monotypy.)

**Indicapus** G. M. MATHEWS, Birds Australia, VII, Pt. III, August 26, 1918, 265.

Type, *Acanthylis sylvatica* TICKELL. [Micropodidae.]  
(Original designation and monotypy.)

**Ispidella** G. M. MATHEWS, Birds Australia, VII, Pt. I, March 4, 1918, 97.

Type, *Halcyon leucogaster* FRASER. [Alcedinidae.]  
(Original designation and monotypy.)

**Karrucincla** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 230.

Type, *Saricola pollux* HARTLAUB. [Turdidae.]  
(Original designation and monotypy.)

- Keartlandia** G. M. MATHEWS, Austral Avian Record, III, No. 4, July 21, 1917, 78.  
 Type, *Acanthiza flaviventris* ASHBY.<sup>20</sup> [Turdidae.]  
 (Monotypy.)  
 = *Aurepethianura* Mathews, 1913, cf. Mathews, Birds Australia, IX, 1922, 339.
- Knestrometopon**<sup>21</sup> O. NEUMANN, Journal für Orn., 68 Jahrg., Heft 1, Jan., 1920, 77.  
 Type, *Sigmodus scopifrons* PETERS. [Prionopidae.]  
 (Original designation and monotypy.)  
 (See *Phaidrometopon* A. Roberts, 1922.)
- Kubaryum** T. MOMIYAMA, Birds of Micronesia, 1922, 1, pl. VII, fig. 4.  
 Type, *Zosterops oleagina* HARTLAUB and FINSCH. [Zosteropidae.]  
 (Original designation and monotypy.)
- Lamprospreo** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 272.  
 Type, *Lamprolornis superbus* RÜPPELL. [Sturnidae.]  
 (Monotypy.)
- Lamprothreptes** A. ROBERTS, Annals Transvaal Museum, VIII, pt. 4, Oct. 30, 1922, 254.  
 Type, *Cinnyris longuemarei* LESSON. [Nectariniidae.]  
 (Original designation and monotypy.)
- Lamprura** J. H. RILEY, Proc. Biol. Soc. Washington, 34, March 31, 1921, 51.  
 Type, *Columba rufigaster* QUOY and GAIMARD. [Treronidae.]  
 (Original designation and monotypy.)
- Lanioides** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 243.  
 Type, *Lanius minor* GMELIN. [Laniidae.]  
 (Original designation and monotypy.)
- Layardiella** G. M. MATHEWS, Birds Australia, VI, Pt. III, April 17, 1917, 289.  
 Type, *Psittacus tabuensis* GMELIN. [Psittacidae.]  
 (Original designation.)  
 For Edgar Leopold Layard. (Mathews.)
- Lazulena** G. M. MATHEWS, Birds Australia, VII, Pt. II, May 15, 1918, 141, 154.  
 Type, *Halcyon macleayii* JARDINE and SELBY. [Alcedinidae.]  
 (Original designation.)
- Leachena** G. M. MATHEWS, Austral Avian Record, III, No. 3, April 7, 1916, 60.  
 Type, *Epthianura crocea* CASTELNAU and RAMSAY. [Turdidae.]  
 (Original designation and monotypy.)
- Leptositta** S. A. BUTURLIN, Travaux Soc. Imp. Nat. Pétrograd, XLIV, Livr. 2, 1916, 153, 156, 169.  
 Type, *Sitta leucopsis* GOULD. [Sittidae.]  
 (Original designation.)  
 (Subgenus of *Sitta* Linnaeus.)
- Leucalcyon** G. M. MATHEWS, Birds Australia, VII, Pt. II, May 15, 1918, 156, 160.  
 Type, *Halcyon saurophaga* GOULD. [Alcedinidae.]  
 (Original designation.)  
 (Subgenus of *Sauropatis*.)
- Leuconympha** E. SIMON, Notice sur les Travaux Scientifiques, 1918, 39; Revue Française d'Orn., VI, No. 120, April 7, 1919, 53.  
 Type, *Trochilus viridipallens* BOURCIER and Mulsant. [Trochilidae.]  
 (Monotypy.)

<sup>20</sup> *Acanthiza flaviventris* Ashby = *Epthianura aurifrons* Gould.<sup>21</sup> Spelt *Knestrometophon* in Ibis, 1921, 563.



- Limnocrex* R. RIDGWAY, Smithsonian Misc. Colls., 72, No. 4, Dec. 6, 1920, 3.  
Type, *Porzana cinereiceps* LAWRENCE. [Rallidae.]  
(Original designation.)  
"λίμνη, a pool, marsh; κρέξ, a crane." (Ridgway.)
- Lioptilornis* H. C. OBERHOLSER, Proc. Biol. Soc. Washington, 34, June 30, 1921, 136.  
Type, *Turdus nigricapillus* VIEILLOT. [Muscicapidae.]  
(Original designation.)  
"λαῖος, laevis; πτελον, penna; ὄρνις, avis." (Oberholser.)
- Lithiophanes*<sup>22</sup> E. SIMON, Notice sur les Travaux Scientifiques, 1918, 38; Revue, Française d'Orn., VI, No. 120, April 7, 1919, 52.  
Type, *Lophornis insignibarbis* SIMON. [Trochilidae.]  
(Monotypy.)
- Loriotus* ex Cuv., F. P. JAROCKI, Zoologia, II, 1821, 133. (See Mathews and Iredale, Austral Avian Record, III, 1918, 144.)  
Type, *Tanagra cristata* GMELIN. (=LINNAEUS, 1766.) [Tanagridae.]  
(Monotypy.)
- Lormarinia* A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 263.  
Type, *Crithagra leucoptera* SHARPE. [Fringillidae.]  
(Monotypy.)  
(Subgenus of *Poliospiza* Bonaparte.)
- Mackenziana* C. CHUBB, Annals and Mag. Nat. Hist., ser. 9, II, No. 7, July, 1918, 123.  
Type, *Thamnophilus leachi* SUCH. [Formicariidae.]  
(Original designation and monotypy.)
- MacLennania* G. M. MATHEWS, Austral Avian Record, III, No. 5, Dec. 28, 1917, 127.  
Type, *Cincloramphus mathewsi* IREDALE. [Turdoididae.]  
(Original designation.)  
Named for William Rae McLennan. (Mathews.)
- Magallais* A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 236.  
Type, *Eremomela usticollis* SUNDEVALL. [Sylviidae.]  
(Original designation and monotypy.)
- Malcoha* ex Vaill., F. P. JAROCKI, Zoologia, II, 1821, 40. (See Mathews and Iredale, Austral Avian Record, III, 1918, 144.)  
Type, *Cuculus pyrrhocephalus* "LATHAM" (=PENNANT, 1769). [Cuculidae.]  
(Monotypy.)
- Mandingoa* E. HARTERT, Novit. Zool., XXVI, No. 1, May 28, 1919, 147.  
Type, *Estrela nitidula* HARTLAUB. [Ploceidae.]  
(Original designation and monotypy.)
- Marianornis* G. M. MATHEWS, Austral Avian Record, III, No. 5, Dec. 28, 1917, 128.  
Type, *Perdix varia* Latham. [Turnicidae.]  
(Original designation.)
- Maricornis* A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 252.  
Type, *Cinnyris mariquensis* A. SMITH [Nectariniidae.]  
(Original designation.)

<sup>22</sup> *Lithiophanes* Simon, Hist. Nat. Trochilidae, 1921, 52; error for *Lithiophanes* Simon, 1918, and corrected in errata, p. 408.

**Massornis** H. C. OBERHOLSER, Auk, XXXVII, No. 3, July, 1920, 455.

Type, *Schiffornis major* DES MURS.

[Pipridae.]

(Original designation and monotypy.)

New name for *Schiffornis* of authors, not of Bonaparte.

"μάσων, major; ἄρνις, avis." (Oberholser.)

**Mastersornis** G. M. MATHEWS, Austral Avian Record, III, No. 4, July 21, 1917, 78.

Type, *Todus rubeculus* LATHAM.

[Muscicapidae.]

(Original designation.)

New name for *Myiagra* Vigors and Horsfield (1827), not *Myagrus* Boie, 1826.

**Mathewsiella** T. IREDALE, Bull. Brit. Orn. Club, XLIII, No. CCLXXII, Nov. 29, 1922, 39.

Type, *Craspedophora magnifica claudia* MATHEWS.<sup>22</sup>

[Paradisaeidae.]

(Original designation and monotypy.)

New name for *Craspedophora* Gray, 1840, preoccupied by *Craspedophorus* Hope, 1838.

**Meganthus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 257.

Type, *Anthus vaalensis* SHELLEY.

[Motacillidae.]

(Original designation.)

**Megacentropus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 220.

Type, *Centropus cupreicaudus* REICHENOW.

[Cuculidae.]

(Original designation and monotypy.)

**Megacerchneis** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 211.

Type, *Falco rupicoloides* A. SMITH.

[Falconidae.]

(Monotypy.)

**Megapasser** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 261.

Type, *Passer motitensis* A. SMITH.

[Fringillidae.]

(Monotypy.)

(Subgenus of *Passer* Brisson.)

**Megathiza** G. M. MATHEWS, Birds Australia, X, Pt. 1, Sept. 28, 1922, 1,6.

Type, *Sericornis magnirostris kerri* MATHEWS.

[Sylviidae.]

(Original designation.)

(Subgenus of *Acanthiza*, but used as a genus.)

**Melanaetus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 209.

Type, *Circætus cinereus* VIEILLOT.

[Buteonidae.]

(Monotypy.)

(Subgenus of *Circætus* Vieillot.)

**Melanalecyon** G. M. MATHEWS, Birds Australia, VII, Pt. II, May 15, 1918, 156, 161.

Type, *Todiramphus funebris* BONAPARTE.

[Alcedinidae.]

(Original designation and monotypy.)

**Melananas** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 204.

Type, *Anas sparsa* EYTON.

[Anatidae.]

(Monotypy.)

<sup>22</sup>The type of *Craspedophora* is not *C. m. claudia* Mathews, and if *Mathewsiella* is a pure substitute name the type should be the same.

**Melanocircus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 207.

Type, *Falco maurus* TEMMINCK.

[*Buteonidae*.]

(Monotypy.)

**Melanolophus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 219.

Type, *Cuculus serratus* SPARRMAN.

[*Cuculidae*.]

(Original designation and monotypy.)

**Melanopica** L. NAVÁS, Anales Facultad Ciencias Zaragoza, I, No. 1, March, <sup>24</sup> 1907, 36; Revista Acad. Ciencias Zaragoza, III, "1918," 1919, 15.

Type, *Corvus pica* LINNAEUS.

[*Corvidae*.]

(Monotypy.)

New name for *Pica* [Brisson].

"Del griego μέλας, μέλαινα, μέλαν, negro; por alusión al color dominante."  
(Navás.)

**Melipodagus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 220.

Type, *Indicator variegatus* LESSON.

[*Indicatoridae*.]

(Original designation and monotypy.)

**Menellia** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 263.

Type, *Poliospiza mennelli* E. C. CHUBB.

[*Fringillidae*.]

(Monotypy.)

(Subgenus of *Poliospiza* Bonaparte.)

**Mesositta** S. A. BUTURLIN, Travaux Soc. Imp. Nat. Pétrograd, XLIV, Livr. 2, 1916, 152, 158, 169.

Type, *Sitta himalayensis* JARDINE and SELBY.

[*Sittidae*.]

(Original designation and monotypy.)

**Metapelecanus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 206.

Type, *Pelecanus roseus* GMELIN.

[*Pelecanidae*.]

(Original designation.)

**Microaetus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 208.

Type, *Aquila wahlbergi* SUNDEVALL.

[*Buteonidae*.]

(Monotypy.)

**Microcinnerys** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 253.

Type, *Certhia chalybea* LINNAEUS.

[*Nectariniidae*.]

(Original designation.)

(Subgenus of *Notiocinnerys* Roberts.)

**Microcochlearius** C. CHUBB, Bull. Brit. Orn. Club, XXXIX, No. CCXLIV, June 30, 1919, 98.

Type, *Euscarthmus josephinae* CHUBB.

[*Tyrannidae*.]

(Original designation and monotypy.)

**Microcrypturus** C. CHUBB, Bull. Brit. Orn. Club, XXXVIII, No. CCXXIX, Dec. 29, 1917, 30.

New name for *Crypturellus* BRABOURNE and CHUBB (type, *Tinamus tataupa*)  
TEMMINCK, preoccupied.

[*Tinamidae*.]

<sup>24</sup> Probably not published until late in June, or early in July. The National Museum copy was mailed by the society July 5.

**Microcursorius** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 202.

Type, *Cursorius temmincki* SWAINSON.

[Cursoriidae.]

(Original designation and monotypy.)

(Subgenus of *Cursorius*.)

**Micromerops** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 215.

Type, *Merops boehmi* REICHENOW.

[Meropidae.]

(Original designation and monotypy.)

**Micronetta** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 204.

Type, *Anas punctata* BURCHELL.

[Anatidae.]

(Original designation and monotypy.)

**Microphila** C. CHUBB, Annals and Mag. Nat. Hist., ser. 9, VII, No. 38, Feb., 1921, 192.

Type, *Sporophila castaneiventris* CABANIS.

[Fringillidae.]

(Original designation and monotypy.)

**Microplectes** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 270.

Type, *Ploceus velatus* VIEILLOT.

[Ploceidae.]

(Original designation and monotypy.)

(Subgenus of *Hyphantornis*, of authors, not Gray, 1844.)

**Micropogonius** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 221.

Type, *Megalaima bilineata* SUNDEVALL.

[Capitonidae.]

(Monotypy.)

(Subgenus of *Barbatula* Lesson=*Pogoniulus* Lafresnaye.)

**Micropsittacus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 212.

Type, *Pionus fuscicapillus* VERREAUX and DES MURS.

[Psittacidae.]

(Original designation.)

(Subgenus of *Poicephalus*.)

**Microserinus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 262.

Type, *Fringilla mozambica* P. L. S. MÜLLER.

[Fringillidae.]

(Original designation and monotypy.)

(Subgenus of *Serinus* Koch.)

**Microsiphonorhis** F. M. CHAPMAN, Bull. Amer. Mus. Nat. Hist., XXXVII, May 14, 1917, 329.

Type, *Microsiphonorhis brewsteri* CHAPMAN.

[Caprimulgidae.]

(Original designation and monotypy.)

**Micrositta** S. A. BUTURLIN, Travaux Soc. Imp. Nat. Pétrograd, XLIV, Livr. 2, 1916, 153, 156, 169.

Type, *Sitta villosa* VERREAUX.

[Sittidae.]

(Original designation.)

(Subgenus of *Sitta* Linnaeus.)

**Microtis** G. I. POLIAKOV, "Birds collected by A. P. Velizhanin in the bassin of upper Irtysh" (in Russian). "1915", p. 99. (Issued with Messenger Ornith., VII, No. 2, April 2 (old style), 1916.

Type, "*Microtis tetrax* (L.)"=*Otis tetrax* LINNAEUS.

[Otididae.]

(Monotypy.)

*Milvulus* "Parbattiah" [=B. H. HODGSON], Bengal Sporting Magazine, VIII, <sup>25</sup> No. 28 (old series No. 44), Oct. 1, 1836, 183.

Type, *Milvus rotundicauda* HODGSON,<sup>26</sup> and the "brahmani cheel" or "*Haliaeetus* Pondicerianus of authors." [Buteonidae.]

(Subgenus of *Milvus*; not *Milvulus* Swainson, 1827.)

*Molīna* F. P. JAROCKI, Zoologia, II, 1821, 315. (See Mathews and Iredale, Austral Avian Record, III, 1918, 143.)

Type, *Aptenodytes chilensis* GMELIN = *Diomedea chilensis* MOLINA. [Spheniscidae.]

(Monotypy.)

*Monacula* F. P. JAROCKI, Zoologia, II, 1821, 55. (See Mathews and Iredale, Austral Avian Record, III, 1918, 143.)

Type, *Pipra albifrons* GMELIN. [Formicariidae.]

(Monotypy.)

*Monarchanax* G. M. MATHEWS, Birds Australia, IX, Pt. 2, April 15, 1921, 93.

Type, *Muscicapa chrysomela* GARNOT. [Muscicapidae.]

(Monotypy.)

*Morphnarchus* R. RIDGWAY, Smithsonian Misc. Colls., 72, No. 4, Dec. 6, 1920, 2.

Type, *Leucopternis princeps* SCLATER. [Buteonidae.]

(Original designation and monotypy.)

"μόρφνος, dusky, dark; ἀρχός, a leader or chief." (Ridgway.)

*Muscifur* O. BAÑGS and T. E. PENARD, Bull. Mus. Comp. Zool., LXIV, No. 4, Jan., 1921, 376.

Type, *Myiarchus semirufus* SCLATER and SALVIN. [Tyrannidae.]

(Original designation and monotypy.)

*Myioparus* A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 225.

Type, *Parisoma plumbeum* HARTLAUB. [Muscicapidae.]

(Monotypy.)

*Nannopsittacus* G. M. MATHEWS, Birds Australia, VI, Pt. I, Nov. 22, 1916, 65.

Type, *Cyclopsitta suavisissima* SCLATER. [Domicellidae.]

(Original designation.)

(See *Suavipsitta* Mathews.)

*Natalornis* A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 222.

Type, *Hirundo atrocaerulea* SUNDEVALL. [Hirundinidae.]

(Monotypy.)

*Neafrapus* G. M. MATHEWS, Birds Australia, VII, Pt. III, August 26, 1918, 264.

Type, *Chaetura cassini* SCLATER. [Micropodidae.]

(Original designation and monotypy.)

*Nemospiza* H. C. OBERHOLSER, Ohio Journ. Sci., XVII, No. 8, June 2, 1917, 335.

Type, *Emberiza henslowi* AUDUBON. [Fringillidae.]

(Original designation.)

"Νέμος, pascuum; and σπιττα, fringilla." (Oberholser.)

*Neocalophasis* N. TAKATSUKASA and N. KURODA, Tori, III, No. 12-13, March, 1922, 37.

Type, *Calophasis mikado* OGILVIE-GRANT. [Phasianidae.]

(Original designation and monotypy.)

<sup>25</sup> The individual nos. in this volume are by error credited to vol. VII.

<sup>26</sup> New here, and fully described.

- Neochen** H. C. OBERHOLSER, Journ. Washington Acad. Sci., VIII, No. 17, Oct. 19, 1918, 571.  
 Type, *Anser jubatus* SPIX. [Anatidae.]  
 (Original designation and monotypy.)  
 "Néos, novus; Xῆρ, anser" (Oberholser.)
- Neocisticola** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 238.  
 Type, *Cisticola pusilla* GUNNING and ROBERTS. [Sylviidae.]  
 (Original designation.)
- Neofiscus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 244.  
 Type, *Lanius caudatus* CABANIS. [Laniidae.]  
 (Original designation.)  
 (Subgenus of *Fiscus*.)
- Neoglottis** R. RIDGWAY, Bull. U. S. Nat. Mus., No. 50, Pt. VIII, June 26, 1919, 329.  
 Type, *Scolopox melanoleuca* GMELIN. [Scolopacidae.]  
 (Original designation.)  
 "Néos, new; + *Glottis*." (Ridgway.)
- †**Neogyps** L. H. MILLER, Univ. Calif. Pubs. Bull. Dept. Geology, IX, No. 9, March 10, 1916, 108.  
 Type, *Neogyps errans* MILLER. [Aegypiidae.]  
 (Monotypy.)
- Neohierax** H. K. SWANN, Synopsis Accipitres, ed. 2, Pt. iv, May 20, 1922, 184.  
 Type, *Poliohierax insignis* WALDEN. [Falconidae.]  
 (Original designation and monotypy.)
- Neolanius** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 243.  
 Type, *Lanius excubitorius* PREVOST and DES MURS. [Laniidae.]  
 (Original designation and monotypy.)  
 (Subgenus of *Lanius*.)
- Neoleucotreron** R. C. MCGREGOR, Philippine Journ. Sci., sect. D., XIII, No. 1, Jan., 1918, 2.  
 Type, *Leucotreron merrilli* MCGREGOR. [Treronidae.]  
 (Original designation and monotypy.)  
 (Subgenus of *Leucotreron*.)
- Neomimeta** G. M. MATHEWS, Austral Avian Record, III, No. 3, April 7, 1916, 68.  
 Type, *Mimetes flavocinctus* KING. [Oriolidae.]  
 (Original designation.)
- Neomirafra** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 260.  
 Type, *Alauda fringillaris* SUNDEVAL. [Alaudidae.]  
 (Monotypy.)  
 (Subgenus of *Mirafra* Horsfield.)
- Neonisus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 208.  
 Type, *Accipiter melanoleucus* A. SMITH. [Buteonidae.]  
 (Monotypy.)
- Neopelecanus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 206.  
 Type, *Pelecanus refescens* GMELIN. [Pelecanidae.]  
 (Monotypy.)

Neophedina A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 224.

Type, *Hirundo cincta* BODDAERT.

[Hirundinidae.]

(Original designation and monotypy.)

†Neophrontops L. H. MILLER, Univ. Calif. Pubs. Bull. Dept. Geology, IX, No. 9, March 10, 1916. 106.

Type, *Neophrontops americanus* MILLER.

[Aegypiidae.]

(Monotypy.)

Neorhophias C. E. HELLMAYER, Anzeiger Orn. Ges. Bayern, No. 3, Oct. 15, 1920, 20.

Type, *Formicivora iheringi* HELLMAYER.

[Formicariidae.]

(Original designation and monotypy.)

Nephelicola A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 238.

Type, *Hemipteryx minuta* GUNNING.

[Sylviidae.]

(Original designation.)

Nesobaza G. M. MATHEWS, Birds Australia, V, Pt. II, Feb. 29, 1916, 213.

Type, *Pernis madagascariensis* A. SMITH.

[Buteonidae.]

(Original designation and monotypy.)

Nesoceryx G. M. MATHEWS, Bull. Brit. Orn. Club, XLI, No. CCLIV, Nov. 30, 1920, 35.

Type, *Charadrius bicinctus* JARDINE and SELBY.

[Charadriidae.]

(Original designation and monotypy.)

Nesocorax J. H. RILEY, Auk, XXXVIII, No. 3, July, 1921, 458.

Type, *Gazzola typica* BONAPARTE.

[Corvidae.]

(Original designation.)

New name for *Gazzola* authors, not Bonaparte (*Gazzola* Bonaparte = *Graucalus* of authors.)

Nesotrochis A. WETMORE, Proc. U. S. Nat. Mus., 54, No. 2245, Nov. 21, 1918, 516.

Type, *Nesotrochis debooyi* WETMORE.

[Rallidae.]

(Original designation and monotypy.)

Nigravis E. C. STUART BAKER, Bull. Brit. Orn. Club, XLI, No. CCLIII, Nov. 9, 1920, 10; No. CCLVIII, April 1, 1921, 101.

Type, *Nigravis herberti* BAKER.

[Timaliidae.]

(Monotypy.)

Notafrapus A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 218.

Type, *Notafrapus sheppardi* ROBERTS.

[Micropodidae.]

(Original designation and monotypy.)

Notiocichla A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 228.

Type, *Turdus explorator* VIEILLLOT.

[Turdidae.]

(Original designation and monotypy.)

(Subgenus of *Petrophila* or *Monticola*.)

Notiocrinnyris A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 253.

Type, *Certhia afra* LINNAEUS.

[Nectariniidae.]

(Original designation.)

Notiopsar H. C. OBERHOLSER, Proc. Biol. Soc. Washington, 34, June 30, 1921, 136.

Type, *Turdus curaeus* MOLINA.

[Icteridae.]

(Original designation and monotypy.)

New name for *Curaeus* P. L. Selater, 1862, not *Cureus* Boie, 1831.

"*υβριος, meridionalis; ψαρ, sturnus.*" (Oberholser.)

**Notococcyx** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 219.

Type, *Cuculus solitarius* STEPHENS. [Cuculidae.]  
(Original designation and monotypy.)

**Notonetta** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 204.

Type, *Anas capensis* GMELIN. [Anatidae.]  
(Original designation and monotypy.)

**Notopholia** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 272.

Type, "*Phoenicopterus melanogaster* Swainson=*L. corusca* Nordmann." 27  
(Monotypy.) [Sturnidae.]

**Notopicus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 222.

Type, *Picus notatus* LICHTENSTEIN. [Picidae.]  
(Original designation and monotypy.)

**Notoplotus** G. M. MATHEWS, Birds Australia, Suppl. I, Feb. 16, 1920, 62.

Type, *Plotus novaehollandiae* GOULD. [Anhingidae.]  
(Original designation and monotypy.)

**Notopogonius** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 221.

Type, *Bucco leucomelas* BODDAERT. [Capitonidae.]  
(Original designation and monotypy.)

**Notopsittacus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 212.

Type, *Psittacus robustus* GMELIN. [Psittacidae.]  
(Original designation.)

(Subgenus of *Poicephalus*.)

**Notorchilus** H. C. OBERHOLSER, Proc. Biol. Soc. Washington, 31, Dec. 30, 1918, 204.

Type, *Platyrrhynchus auricularis* VIEILLOT. [Tyrannidae.]  
(Original designation.)

"*νόρος, meridies ορχίλος, regulus.*" (Oberholser.)

**Nototockus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 214.

Type, *Toccos monteiri* HARTLAUB. [Bucerotidae.]  
(Original designation and monotypy.)

**Nutchera** G. M. MATHEWS, Birds Australia, VII, Pt. II, May 15, 1918, 153, 160.

Type, *Halcyon badia* VERREAUX. [Alcedinidae.]  
(Original designation and monotypy.)

**Nycticircus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 216.

Type, *Caprimulgus trimaculatus* SWAINSON. [Caprimulgidae.]  
(Monotypy.)

**Nyctictypus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 216.

Type, *Caprimulgus rufigena* A. SMITH. [Caprimulgidae.]  
(Monotypy.)

**Nyctiperdix** A. ROBERTS, Annals Transvaal Museum VIII, Pt. 4, Oct. 30, 1922, 196.

Type, *Pterocles bicinctus* TEMMINCK. [Pteroclididae.]  
(Original designation.)

<sup>27</sup> Lapsus for *Lamprolornis melanogaster* Swainson=*Lamprolornis corrusca* Nordmann, 1835.



*Nyctisyrigmus* A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 216.

Type, *Caprimulgus pectoralis* CUVIER. [Caprimulgidae.]  
(Original designation.)

*Ocelletus* L. NAVÁS, Revista Acad. Ciencias Zaragoza, III, "1918", 1919, 56.  
New name for *Regulus* "Vieillot."

Type, *Motacilla regulus* LINNAEUS (first species mentioned). [Regulidae.]

*Ochrospiza* A. ROBERTS, Annals Transvaal Museum VIII, Pt. 4, Oct. 30, 1922, 262.

Type, *Fringilla angolensis* Gmelin<sup>28</sup>= *F. tobaca* VIEILLOT. [Fringillidae.]  
(Original designation and monotypy.)

*Oestrelatella* V. L. BIANCHI, Faune Russie, I, Oiseaux, Pt. 2, 1913, 521, 719.

Type, *Oestrelata hypoleuca* SALVIN. [Puffinidae.]  
(Original designation.)

(Subgenus of *Aestrelata*.)

*Oinobas*<sup>29</sup> W. SWAINSON, in Murray, Encycl. Geography, 1834, 1299.

Type, not mentioned; genus is a *nomen nudum* here. [Tanagridae?]

*Onychostruthus* C. W. RICHMOND, Auk, XXXIV, No. 1, Jan., 1917, 89.

Type, *Onychospiza taczanowskii* PRJEVALSKI. [Fringillidae.]  
(Original designation and monotypy.)

New name for *Onychospiza* Prjevalski, 1876, not *Onychospiza* Rey, 1872.

*Oraöstis* R. RIDGWAY, Smithsonian Misc. Colls., 72, No. 4, Dec. 6, 1920, 1.

Type, *Falco isidori* DES MURS. [Buteonidae.]  
(Original designation and monotypy.)

"*ōpos*, mountain; *āerōs*, eagle." (Ridgway.)

*Orodytes* J. H. RILEY, Proc. Biol. Soc. Washington, 34, March 31, 1921, 52.

Type, *Arachnothera? celebensis* MEYER and WIGLESWORTH.  
(Original designation.) [Meliphagidae.]

*Orospingus* J. H. RILEY, Proc. Biol. Soc. Washington, 35, March 20, 1922, 61.

Type, *Chlorospingus goeringi* SCLATER and SALVIN. [Tanagridae.]  
(Original designation and monotypy.)

†*Orthopteryx* C. WIMAN, Wiss. Ergebn. der Schwedischen Südpolar-Exped. 1901–1903, III, Lief. 1, 1905, 27, pl. viii, figs. 2, 2a, 2b.

Type, *Orthopteryx gigas* WIMAN. [Spheniscidae?]  
(Monotypy.)

*Pacificodroma* V. L. BIANCHI, Faune Russie, Oiseaux, I, Pt. 2, 1913, 516, 559.

Type, *Thalassidroma monorhis* SWINHOE. [Hydrobatidae.]  
(Original designation.)

(Subgenus of *Oceanodroma*.)

†*Palæochenoides* R. W. SHUFELDT, Geol. Magazine, Decade VI, III, No. 626, Aug., 1916, 347.

Type, *Palæochenoides mioceanus* SHUFELDT. [Incertae sedis.<sup>30</sup>]  
(Monotypy.)

"Παλαιός=ancient, +χήν, a goose, +οειδής." (Shufeldt.)

*Palaeolais* A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 234.

Type, *Sylvia palustris* BECHSTEIN. [Sylviidae.]  
(Monotypy.)

<sup>28</sup>*Fringilla angolensis* Gmelin is preoccupied by *F. angolensis* Linnaeus.

<sup>29</sup>This is a bird of the "American Continent," and not found in Europe. It is placed between *Nemosis* and *Pyrranga* Vieillot. The only other reference to this genus I have seen is in Gray, Catal. Gen. and Subgen. Birds, 1855, 156, where it is also a *nomen nudum*.

<sup>30</sup>Originally placed in the Anseres, but Wetmore, Jour. Geology, XXV, No. 6, Sept.-Oct., 1917, 555-557, refers it to the Steganopodes.

- Papualestes** G. M. MATHEWS, Birds Australia, VIII, Pt. 4, Oct. 13, 1920, 186.  
 Type, *Myiolestes* (?) *cyanus* SALVADORI. [Muscicapidae.]  
 (Original designation and monotypy.)
- Papuanapus** G. M. MATHEWS, Birds Australia, VII, Pt. III, August 26, 1918, 266.  
 Type, *Chaetura novae guineae* D'ALBERTIS and SALVADORI.  
 (Original designation and monotypy.) [Micropodidae.]
- Papuorthonyx** G. M. MATHEWS, Birds Australia, IX, Pt. 4, Oct. 19, 1921, 177.  
 Type, *Orthonyx novaeguineae* MEYER. [Turdoididae.]  
 (Original designation and monotypy.)
- Parvifregata** G. M. MATHEWS, Birds Australia, Suppl. I, Feb. 16, 1920, 64.  
 Type, *Atagen ariel* GRAY. [Fregatidae.]  
 (Original designation and monotypy.)
- Parvipsitta** G. M. MATHEWS, Birds Australia, VI, Pt. 1, Nov. 22, 1916, 43.  
 Type, *Psittacus pusillus* WHITE. [Domicellidae.]  
 (Original designation.)  
 (Subgenus of *Glossopsitta* Bonaparte.)
- Pelagodyptes** R. C. MURPHY and F. HARPER, Bull. Amer. Mus. Nat. Hist., XLIV, Déc. 23, 1921, 503, 519.  
 Type *Pelecanoides georgica* MURPHY and HARPER. [Pelecanoididae.]  
 (Monotypy.)  
 (Subgenus of *Pelecanoides*.)  
 "Πέλαγος, the open sea; +δύτης, a diver." (Murphy and Harper.)
- Penemonarcha** G. M. MATHEWS, Birds Australia, IX, Pt. 2, April 15, 1921, 93.  
 Type, *Monarcha axillaris* SALVADORI. [Muscicapidae.]  
 (Monotypy.)
- Penecenanthe** G. M. MATHEWS, Birds Australia, VIII, Pt. 5, Dec. 15, 1920, 273.  
 Type, *Eopsaltria leucura* GOULD. [Muscicapidae.]  
 (Original designation.)
- Peneothello** G. M. MATHEWS, Birds Australia, VIII, Pt. 4, Oct. 13, 1920, 185.  
 Type, *Poecilodryas sigillata* DE VIS. [Muscicapidae.]  
 (Original designation and monotypy.)
- Perenohierax** R. RIDGWAY, Smithsonian Misc. Colls., 72, No. 4, Dec. 6, 1920, 2.  
 Type, *Falco leucorrhous* QUOY and GAIMARD. [Buteonidae.]  
 (Original designation and monotypy.)  
 "Περικνός, dark-colored, dusky; λέραξ, a hawk." (Ridgway.)
- Perissolalage** H. C. OBERHOLSER, Proc. U. S. Nat. Mus., 54, No. 2232, Nov. 2, 1917, 182.  
 Type, *Perissolalage chalepa* OBERHOLSER. [Campephagidae.]  
 (Original designation and monotypy.)  
 "Περισσός, mirabilis; and Lalage (λαλαγή, loquacitas)." (Oberholser.)
- Perissonetta** H. C. OBERHOLSER, Proc. Indiana Acad. Sci., for 1920, 1921?, 110.  
 Type, *Anas collaris* DONOVAN. [Anatidae.]  
 (Original designation and monotypy.)  
 "Perissós, mirabilis; nētta, anas." (Oberholser.)
- Petranthus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 258.  
 Type, *Anthus crenatus* FINSCH and HARTLAUB. [Motacillidae.]  
 (Original designation and monotypy.)
- Petrornis** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 228.  
 Type, *Turdus rupestris* VIEILLLOT. [Turdidae.]  
 (Monotypy.)  
 (Subgenus of *Petrophila*.)

- Phæoaëstus** R. RIDGWAY, Smithsonian Misc. Colls., 72, No 4, Dec. 6, 1920, 2.  
Type, *Falco limnaetus* HORSFIELD. [Buteonidae.]  
(Original designation and monotypy.)  
"Φαίος, brown, dusky; αἰετός, eagle." (Ridgway.)
- Phæorhadina** G. M. MATHEWS and T. IREDALE, Austral Avian Record, III, No. 5, Dec. 28, 1917, 116.  
Type, *Phillopneuste fuscata* BLYTH. [Sylviidae.]  
(Monotypy.)
- Phaidrometopon** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 248.  
Type, *Sigmodus scopifrons* PETERS. [Prionopidae.]  
(Original designation and monotypy.)  
(See *Knestrometopon* Neumann.)
- Phoenichelidon** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 223.  
Type, *Hirundo semirufa* SUNDEVALL. [Hirundinidae.]  
(Original designation.)
- Phoeniculus** F. P. JAROCKI, Zoologia, II, 1821, 63. (See Mathews and Iredale, Austral Avian Record, III, 1918, 143.)  
Type, *Upupa erythrorhynchos* LATHAM. [Phoeniculidae.<sup>31</sup>]  
(Subsequent designation, Mathews and Iredale, 1918.)
- Phoenicuroides** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 231.  
Type, "Tractrac" of Levaillant, or *Saxicola layardi* SHARPE = *Motacilla tractrac* Wilkes, 1817. [Turdidae.]  
(Monotypy.)
- Picrotes** C. CHUBB, Annals and Mag. Nat. Hist., ser. 9, II, No. 7, July, 1918, 123.  
Type, *Lanius severus* LICHTENSTEIN. [Formicariidae.]  
(Original designation and monotypy.)  
New name for *Lochites* Cabanis and Heine, 1859, not Gistel, 1848.
- Pileata** T. BROWN, Illustr. Genera Birds, "No. VII, Oct., 1845, sig. w (2)."  
See Mathews, Birds Australia, Suppl. I, Feb. 16, 1920, 60.)  
Type, cited as a synonym of *Biziura* STEPHENS, 1824. [Anatidae.]
- Piocercus** E. SIMON, Notice sur les Travaux Scientifiques, 1918, 39; Revue Française d'Orn., VI, No. 120, April 7, 1919, 54.  
Type, *Trochilus eliza* LESSON and DELATTRE. [Trochilidae.]  
(Original designation and monotypy.)
- Pitalla** L. NAVÁS, Bol. Soc. Aragonesa Ciencias Nat., IX, No. 4, April, 1910, 98.  
New name for *Pyrrhia* NAVÁS, 1907, not *Pyrrhia* Hübner, 1822. [Fringillidae.]
- Platycorax** H. C. OBERHOLSER, Journal Washington Acad. Sci., IX, No. 6, Mar. 19, 1919, 167.  
Type, *Buceros semigaleatus* TWEEDDALE. [Bucerotidae.]  
(Original designation and monotypy.)  
"Πλατός, latus; κοράξ, corvus." (Oberholser.)
- Plesialcyon** G. M. MATHEWS, Birds Australia, VII, Pt. II, May 15, 1918, 152.  
Type, *Alcedo smyrnensis* LINNAEUS. [Alcedinidae.]  
(Original designation.)
- Plesiodyras** G. M. MATHEWS, Birds Australia, VIII, Pt. 4, Oct. 13, 1920, 185.  
Type, *Megalestes albonotatus* SALVADORI. [Muscicapidae.]  
(Original designation and monotypy.)  
New name for *Megalestes* Salvadori, 1875, not Selys-Longchamps, 1862.

<sup>31</sup> As this name displaces *Irisor* Lesson, 1830, the family name will require change as above. See Sclater, Systema Avium Ethiopicarum, 1924, 233.

**Plesiositagra** T. IREDALE and D. A. BANNERMAN, Bull. Brit. Orn. Club, XLI, No. CCLX, May 26, 1921, 129.

Type, *Hyphantornis spekei* HEUGLIN. [Ploceidae.]

(Original designation and monotypy.)

New name for *Hyphantornis* authors, not of Gray, 1844; see also Oberholser, Proc. Biol. Soc. Washington, 34, March 31, 1921, 79.

**Poecilositata** S. A. BUTURLIN, Travaux Soc. Imp. Nat. Pétrograd, XLIV, Livr. 2, 1916, 149, 156, 167.

Type, *Sitta azurea* LESSON. [Sittidae.]

(Original designation and monotypy.)

New name for *Dendrophila* Swainson, preoccupied.

**Poecilurus** W. E. C. TODD, Proc. Biol. Soc. Washington, 30, July 27, 1917, 129.

Type, *Synallaxis candei* LAFRESNAYE. [Furnariidae.]

(Original designation.)

**Poliolæma** C. CHUBB, Annals and Mag. Nat. Hist., ser. 9, II, No. 7, July, 1918, 124; Bull. Brit. Orn. Club, XXXIX, No. CCXXXVIII, Jan. 3, 1919, 42.

Type, *Myrmotherula cinereiventris* SCLATER and SALVIN. [Formicariidae.]

(Original designation and monotypy.)

**Poliositta** H. C. ROBINSON and C. B. KLOSS, Journ. Fed. Malay States Mus., VIII, Pt. II, Dec., 1918, 228.

Type, *Callisitta azurea expectata* HARTERT. [Sittidae.]

(Monotypy.)

(Not indicated as new here; probably = *Poecilositata* Buturlin.)

**Porthmornis** R. C. MURPHY and F. HARPER, Bull. Amer. Mus. Nat. Hist., XLIV, Dec. 23, 1921, 503, 513.

Type, *Puffinuria garnotii magellani* MATHEWS. [Pelecanoididae.]

(Monotypy.)

(Subgenus of *Pelecanoides*.)

"Πορθμός, a strait + ὄρνις, a bird." (Murphy and Harper.)

**Praedo** O. KLEINSCHMIDT, Falco, XIII, No. 2, May, 1917, 10; Beilage, "Ornis Germanica," May 1917, 6.

Type, used for all "Raubvögel" except "Falken" and "Geier". *Falco buteo* LINNAEUS is the first species mentioned. [Buteonidae.]

(Not *Praedo* Nelson, 1912.)

**Pratincola** T. PENNANT, Brit. Zool., 4th ed., II. 1776, 648 (4°) 759 (8°); See Mathews and Iredale, Austral Avian Record, V, 1923, 65.

Type, *Pratincola krameria* PENNANT. [Cursoriidae.]

(Monotypy)

**Priniops** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 236.

Type *Drymoica ocularius* A. SMITH. [Sylviidae.]

(Monotypy.)

†**Procariam** C. ROVERETO, Anales Mus. Nac. Buenos Aires, XXV, 1914, 110, pl. XI, fig. 1, 7.

Type *Procariam simplex* ROVERETO. ["Hermosiorinidae".]

(Monotypy.)

**Proconurus** A. de M. RIBEIRO, Revista Museu Paulista, XII, "1920" (1922?), 7, 21, 79.

Type, *Psittacus nobilis* LINNAEUS (first species mentioned). [Psittacidae.]

**Prodosia** E. SIMON, Notice sur les Travaux Scientifiques, 1918, 39; Revue Française d'Orn., VI, No. 120, April 7, 1919, 53.

Type *Oreopyra hemileuca* SALVIN. [Trochilidae.]

(Monotypy.)

- Pronospiza** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 262.  
Type, *Crithagra canicollis* SWAINSON. [Fringillidae.]  
(Original designation and monotypy.)  
(Subgenus of *Serinus* Koch.)
- †**Prophororhacus** C. ROVERETO, Anales Mus. Nac. Buenos Aires, XXV, 1914, 114, pl. X, fig. 2  
Type, *Prophororhacus incertus* ROVERETO. [Phororhacidae.]  
(Monotypy.)
- Propyrrhura** A. de M. RIBEIRO, Revista Museu Paulista, XII, "1920" (1922?), 7.<sup>32</sup>  
Type, *Macrocerus maracana* VIEILLLOT. [Psittacidae.]  
(Original designation and monotypy.)
- Proseisura** G. M. MATHEWS, Bull. Brit. Orn. Club, XLI, No. CCLIV, Nov. 30, 1920, 35.  
Type, *Arses lorealis* DE VIS. [Muscicapidae.]  
(Original designation and monotypy.)
- Psammocincla** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 231.  
Type, *Saxicola albicans* WAHLBERG. [Turdidae.]  
(Monotypy.)
- Psammospiza** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 263.  
Type, *Crithagra albogularis* A. SMITH. [Fringillidae.]  
(Monotypy.)  
(Subgenus of *Crithagra* Swainson.)
- Pseudhaleyon** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 213.  
Type, *Alcedo leucocephala* P. L. S. MÜLLER. [Alcedinidae.]  
(Monotypy.)
- Pseudhemipteryx** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 238.  
Type, *Drymoica natalensis* A. SMITH. [Sylviidae.]  
(Original designation and monotypy.)  
(Subgenus of *Drymodyta* Sundevall.)
- Pseudhirundo** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 223.  
Type, *Hirundo griseopyga* SUNDEVALL. [Hirundinidae.]  
(Original designation and monotypy.)
- Pseudocarbo** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 205.  
Type, *Pelecanus capensis* SPARRMAN. [Phalacrocoracidae.]  
(Original designation and monotypy.)
- Pseudocircus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 207.  
Type, *Accipiter macrourus* S. G. GMELIN. [Buteonidae.]  
(Original designation and monotypy.)
- Pseudocoeligena** E. SIMON, Hist. Nat. Trochilidae, 1921, 171, 363.  
Type, *Ornismya coeligena* LESSON (first species mentioned). [Trochilidae.]  
(Proposed as a "section" of *Lampropygia* Reichenbach.)  
(See *Coeliola* Simon.)
- Pseudokonopophaga** C. CHUBB, Annals and Mag. Nat. Hist., ser. 9, II, No. 7, July, 1918, 122.  
Type, *Conopophaga melanogaster* MÉNÉTRIÉS. [Conopophagidae.]  
(Original designation and monotypy.)

<sup>32</sup> *Propyrrhura* on p. 18.

- Pseudodiphlogæna** E. SIMON, Hist. Nat. Trochilidae, 1921, 166, 360.<sup>33</sup>  
 Type, *Trochilus violifer* GOULD (first species mentioned). [*Trochilidae*.]  
 (Proposed as a "section" of *Helianthea* Gould.)
- Pseudohomophania** E. SIMON, Hist. Nat. Trochilidae, 1921, 171, 362.  
 Type, *Trochilus wilsoni* DELATTRE and BOURCIEUR (first species mentioned). [*Trochilidae*.]  
 (Proposed as a "section" of *Lampropygia* Reichenbach.)
- Pseudosicalis** C. CHUBB, Bull. Brit. Orn. Club, XLI, No. CCLVII, Feb. 24, 1921, 78.  
 Type, *Sycalis aureiventris* PHILIPPI and LANDBECK. [*Fringillidae*.]  
 (Original designation and monotypy.)
- Pseudosiptornis** C. B. CORY, Proc. Biol. Soc. Washington, 32, Sept. 30, 1919, 150.  
 Type, *Siptornis ottonis* BERLEPSCH. [*Furnariidae*.]  
 (Original designation and monotypy.)
- Pseudotadorna** N. KURODA, Tori, I, No. 5, Dec. 7, 1917, 1, fig. 1.  
 Type, *Pseudotadorna cristata* KURODA. [*Anatidae*.]  
 (Monotypy.)
- Pseudoturdus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 227.  
 Type, *Turdus guttatus* VIGORS. [*Turdidae*.]  
 (Original designation and monotypy.)
- Psittacula** ex Pall., F. P. JAROCKI, Zoologia, II, 1821, 306. (See Mathews and Iredale, Austral Avian Record, III, 1918, 144.)  
 Type, *Alca psittacula* GMELIN (=PALLAS, 1769). [*Alcidae*.]  
 (Monotypy.)
- Psomophilus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 255.  
 Type, *Motacilla capensis* LINNAEUS. [*Motacillidae*.]  
 (Original designation and monotypy.)  
 (Subgenus of *Motacilla* Linnaeus.)
- Pteropus** "Lath." J. JENNINGS, Ornithologia, ed. 2, 1829, 36, 390.  
 Type, *P. africanus* "Lath." (= *Podica petersi* HARTLAUB?). [*Heliornithidae*.]  
 (Subsequent designation, Mathews and Iredale, Austral Avian Record, IV, 1922, 175.)
- Pycnorhinus** L. NAVÁS, Anales Facultad Ciencias Zaragoza, I No. 2, June, 1907, 124; Revista Acad. Ciencias Zaragoza, III, "1918." 1919, 20.  
 Type, *Loxia coccothraustes* LINNAEUS. [*Fringillidae*.]  
 (Monotypy.)  
 New name for *Coccothraustes* "Pall."  
 "Del griego πυκνός grueso y ρίς, ῥίς, nariz; alusión al tamaño y grosor de la comisura del pico." (NAVÁS.)
- Pyrrhia** L. NAVÁS, Anales Facultad Ciencias Zaragoza, I, No. 2, June, 1907, 128.  
 Type, *Loxia pyrrhula* LINNAEUS (first species mentioned). [*Fringillidae*.]  
 New name for *Pyrrhula* "Pall."  
 (See *Pitalla*.)  
 "De πυρρός, rojo." (NAVÁS.)
- Rahcinta** G. M. MATHEWS, Austral Avian Record, III, No. 3, April 7, 1916, 58.  
 Type, *Atrichia clamosa* GOULD. [*Atrichornithidae*.]  
 (Original designation and monotypy.)
- Remiz** F. P. JAROCKI, Spis Ptaków, 1819, 21.  
 Type, *Parus pendulinus* GMELIN. [*Paridae*.]  
 (Monotypy.)

<sup>33</sup>Spelt *Pseudodiphlogena* on p. 360.

Rhathymodyta A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 238.

Type, *Drymoica aberrans* A. SMITH.  
(Original designation and monotypy.)

[Sylviidae.]

(Subgenus of *Drymodyta* Sundevall.)

Rhothonia R. J. MURPHY, Bull. Amer. Mus. Nat. Hist., XXXVII, Dec. 10, 1917, 8(1).

Type, *Diomedea (Rhothonia) sanfordi* MURPHY.

[Diomedidae.]

(Original designation and monotypy.)

(Subgenus of *Diomedea*.)

"Paddies, the nostrils." (MURPHY.)

Richmondia G. M. MATHEWS and T. IREDALE, Austral Avian Record, III, No. 6, June 25, 1918, 145.

Type, *Loxia cardinalis* LINNAEUS.

[Fringillidae.]

(Original designation.)

New name for *Cardinalis* Bonaparte, 1838, nec *Cardinalis* Jarocki, 1821.

Named for Charles W. Richmond (Mathews and Iredale).

Rossornis G. M. MATHEWS, Birds Australia, VII, Pt. III, Aug. 26, 1918, 234.

Type, *Caprimulgus macrurus* HORSFIELD.

[Caprimulgidae.]

(Original designation and monotypy.)

Rukia T. MOMIYAMA, Birds of Micronesia, 1922, 2, pl. VII, fig. 5.

Type, *Tephros ruki* HARTELT.

[Zosteropidae.]

(Original designation and monotypy.)

Sabota A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 260.

Type, *Mirafrja sabota* A. SMITH.

[Alaudidae.]

(Original designation and tautonymy.)

Sakesphorus C. CHUBB, Annals and Mag. Nat. Hist., ser. 9, II, No. 7, July, 1918, 123.

Type, *Lanius canadensis* LINNAEUS.

[Formicariidae.]

(Original designation and monotypy.)

New name for *Hypolophus* Cabanis and Heine, 1859, not Müller and Henle, 1837.

Salicaria T. FORSTER, Pocket Encycl. Nat. Phenomena, 1827, 412. (See Mathews and Iredale, Austral Avian Record, IV, 1921, 162.)

Type, "*Salicaria fluviatilis*" = *Sylvia fluviatilis* WOLF (first of six species mentioned).

[Sylviidae.]

Salvatoria A. de M. RIBEIRO, Revista Museu Paulista, XII, "1920" (1922?) 68.

Type, *Psittacus xanthops* SPIX.

[Psittacidae.]

(Monotypy.)

Sathrocercus O. NEUMANN, Journal für Orn., 68 Jahrg., Heft 1, Jan., 1920, 78.

Type, *Bradypterus barakæ* SHARPE.

[Sylviidae.]

(Original designation and monotypy.)

Schoenocrex A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 197.

Type, *Rallus pusillus* PALLAS.

[Rallidae.]

(Monotypy.)

Sciocincla A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 232.

Type, *Saxicola arnotti* TRISTRAM.

[Turdidae.]

(Original designation and monotypy.)

Sclaterillas A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 226.

Type, *Andropadus debilis* W. L. SCLATER.

[Pycnonotidae.]

(Monotypy.)

- Sclaterornis** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 251.  
Type, *Nectarinia arturi* P. L. SCLATER. [Nectariniidae.]  
(Original designation.)
- Selatopogon** E. SIMON, Revue Française d'Orn., VI, No. 120, April 7, 1919, 53.  
Type, *Trochilus ruficeps* GOULD. [Trochilidae.]  
(Original designation and monotypy.)
- Serinops** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 264.  
Type, "*Loxia flaviventris* Swainson" [=GMELIN?]. [Fringillidae.]  
(Original designation.)
- Shelleyia** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 252.  
Type, *Cinnyris shelleyi* ALEXANDER. [Nectariniidae.]  
(Original designation and monotypy.)
- Simonula** C. CHUBB, Birds Brit. Guiana, I, 1916, 413 (note).  
Type, "*S. chloriceps* (Gould)." = *Trochilus floriceps* GOULD. [Trochilidae.]  
(Original designation and monotypy.)  
New name for *Anthocephala* Cabanis and Heine, preoccupied by *Anthocephalus* Rudolphi, 1819, a genus of Vermes.
- Siptornoides** C. B. CORY, Proc. Biol. Soc. Washington, 32, Sept. 30, 1919, 150.  
Type, *Siptornis flammulata* JARDINE. [Furnariidae.]  
(Original designation.)
- Siptornopsis** C. B. CORY, Proc. Biol. Soc. Washington, 32, Sept. 30, 1919, 150.  
Type, *Siptornis hypochondriacus* SALVIN. [Furnariidae.]  
(Original designation and monotypy.)
- Smaragdochroa** E. SIMON, Notice sur les Travaux Scientifiques, 1918, 39; Revue Française d'Orn., VI, No. 120, April 7, 1919, 53.  
Type, *Heliodoxa jacula* GOULD. [Trochilidae.]  
(Monotypy.)
- Smithaetus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 209.  
Type, *Circaetus pectoralis* A. SMITH. [Buteonidae.]  
(Monotypy.)  
(Subgenus of *Circaetus* Vieillot.)
- Smitsornis** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 202.  
Type, *Cursorius africanus* TEMMINCK. [Cursoriidae.]  
(Original designation and monotypy.)
- Spizitornis** H. C. OBERHOLSER, Auk, XXXVII, No. 3, July, 1920, 453.  
Type, *Muscicapa parulus* KITTLITZ. [Tyrannidae.]  
(Original designation.)  
New name for *Anaeretes* Reichenbach, 1850, not *Anaeretes* Dejean, 1837.  
"Σπιζιτῆρς, parus; ὄρνις, avis." (Oberholser.)
- Stephanoaetus** W. L. SCLATER, Bull. Brit. Orn. Club, XLII, No. CCLXVI, Feb. 25, 1922, 75.  
Type, *Falco coronatus* LINNAEUS. [Buteonidae.]  
(Original designation and monotypy.)
- Sterrhoptilus** H. C. OBERHOLSER, Journ. Washington Acad. Sci., VIII, No. 12, June 19, 1918, 394.  
Type, *Mixornis capitalis* TWEEDDALE. [Timaliidae.]  
(Original designation.)  
"Στερρόβις, rigidu, πτελον, penna." (Oberholser.)
- Stictomyrmornis** C. CHUBB, Bull. Brit. Orn. Club, XXXIX, No. CCXL, Feb. 28, 1919, 59.  
Type, *Pipra naevia* GMELIN. [Formicariidae.]  
(Original designation.)



Suaheliornis O. NEUMANN, Journal für Orn., 68 Jahrg., Heft 1 Jan., 1920, 77.

Type, *Phyllastrephus kretzschmeri* REICHENOW and NEUMANN.

[*Timaliidae*.]

(Subsequent designation, Stone, 1920.)

Suavipsitta G. M. MATHEWS, Birds Australia, VI, Pt. VI, Dec. 11, 1917, xix.

Type, *Cyclopsitta suavisissima* P. L. SCLATER.

[*Domicellidae*.]

New name for *Nannopsittacus* Mathews, 1916, not *Nannopsittaca* Ridgway, 1912.

Subacanthiza G. M. MATHEWS, Birds Australia, IX, Pt. 9, August 3, 1922, 449.

Type, *Acanthiza lineata* GOULD.

[*Sylviidae*.]

(Original designation.)

(Subgenus of *Acanthiza*.)

Sugomel G. M. MATHEWS, Austral Avian Record, V, No. 1, July 17, 1922, 7.

Type, *Myzomela nigra ashbyi* MATHEWS.

[*Meliphagidae*.]

(Original designation and monotypy.)

Surniculoides A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 219.

Type, *Cuculus clamosus* LATHAM.

[*Cuculidae*.]

(Original designation and monotypy.)

Swynnertonia A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 232.

Type, *Erithacus swynnertoni* SHELLEY.

[*Turdidae*.]

(Monotypy.)

(Subgenus of *Erithacus*.)

For C. F. M. Swynnerton. (Roberts.)

Tachydyta A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 238.

Type, *Cisticola kalahari* OGILVIE-GRANT.

[*Sylviidae*.]

(Original designation and monotypy.)

Tachymarpitis A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 216.

Type, *Hirundo melba* LINNAEUS.

[*Micropodidae*.]

(Original designation and monotypy.)

Taphrolesbia E. SIMON, Notice sur les Travaux Scientifiques, 1918, 39.

Type, *Cynanthus griseiventris* TACZANOWSKI.

[*Trochilidae*.]

(Monotypy.)

Tavistocka G. M. MATHEWS, Birds Australia, VII, Pt. V, July 10, 1919, 434.

Type, *Loxia guttata* SHAW.

[*Ploceidae*.]

(Original designation.)

Telacanthura G. M. MATHEWS, Birds Australia, VII, Pt. III, August 26, 1918, 264.

Type, *Chaetura ussheri* SHARPE.

[*Micropodidae*.]

(Original designation.)

(Proposed as a genus or subgenus.)

Teledromas A. WETMORE and J. L. PETERS, Proc. Biol. Soc. Washington, 35, March 20, 1922, 41.

Type, *Rhinocrypta fusca* SCLATER and SALVIN.

[*Rhinocryptidae*.]

(Original designation and monotypy.)

Tephrolesbia E. SIMON, Revue Française d'Orn., VI, No. 120, April 7, 1919, 54.

Emendation of *Taphrolesbia* SIMON, 1918.

[*Trochilidae*.]

Tephropsilus E. SIMON, Hist. Nat. Trochilidae, 1921, 103, 319.

Emendation of *Taphropsilus* SIMON, 1910.<sup>34</sup>

[*Trochilidae*.]

<sup>34</sup> He says "Ecrit *Taphropsilus* par suite d'un lapsus." However, it was originally written "*Taphropsilus*," and not *Taphropsitus*. The spelling *Taphropsilus* occurs in his "Notice sur les Travaux Scientifiques," 1918, 38.

- †**Thiornis** L. NAVÁS, Boletín Soc. Ibérica Ciencias Naturales, XXI (IV), No. 3-4, Marzo-Abril, 1922, 59, pl. 2.  
 Type, *Thiornis sociata* NAVÁS. [Rallidae.]  
 (Original designation and monotypy.)  
 “De Θείον azufre y άρνις ave.” (Navás.)
- Threnetes** <sup>35</sup> A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 238.  
 Type, *Drymoica erythrops* HARTLAUB. [Sylviidae.]  
 (Monotypy.)  
 (Subgenus of *Drymodyta* Sundevall.)
- Threnodyta** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 239.  
 Type, *Drymoica subruficapilla* A. SMITH. [Sylviidae.]  
 (Original designation and monotypy.)  
 (Subgenus of *Drymodyta* Sundevall.)
- Threnodytops** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 239.  
 Type, *Drymoica chiniana* A. SMITH. [Sylviidae.]  
 (Original designation and monotypy.)  
 (Subgenus of *Drymodyta* Sundevall.)
- Thryocrex** R. RIDGWAY, Smithsonian Misc. Colls., 72, No. 4, Dec. 6, 1920, 4.  
 Type, *Corethrura rubra* SCLATER and SALVIN. [Rallidae.]  
 (Original designation and monotypy.)  
 “Θρύον, a rush; κρέξ, a crane.” (Ridgway.)  
 (Spelt *Thrypocrex*, in Orn. Monatsber., 29, 1921, 112.)
- Thryospiza** H. C. OBERHOLSER, Ohio Journal of Science, XVII, No. 8, June 2, 1917, 332.  
 Type, *Fringilla maritima* WILSON. [Fringillidae.]  
 (Original designation.)  
 Θρύον, juncus; and στίξα, fringilla.” (Oberholser.)
- †**Tinamisornis** C. ROVERETO, Anales Mus. Nac. Buenos Aires, XXV, 1914, 161.  
 Type, *T. intermedius* ROVERETO (first species mentioned). [Tinamidae.]
- Todaleyon** G. M. MATHEWS, Birds Australia, VII, Pt. II, May 15, 1918, 158, 161.  
 Type, *Todiramphus recurvirostris* LAFRESNAYE. [Alcedinidae.]  
 (Original designation and monotypy.)
- Toenia** ex Vaill.,<sup>36</sup> F. P. JAROCKI, Zoologia, II, 1821, 88. (See Mathews and Iredale, Austral Avian Record, III, 1918, 144.)  
 Type, *Corvus varians* LATHAM. [Corvidae.]  
 (Monotypy.)
- Trimenornis** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 213.  
 Type, *Coracias spatulatus* TRIMEN. [Coraciidae.]  
 (Original designation and monotypy.)

<sup>35</sup> Not *Threnetes* Gould, 1852.<sup>36</sup> Refer also to *Tenia* Oken, in my second supplement.

**Tropicranus** W. L. SCLATER, Bull. Brit. Orn. Club, XLII, No. CCLXVI, Feb. 25, 1922, 76.

Type, *Ortholophus cassini* FINSCH.<sup>37</sup>

[Bucerotidae.]

(Original designation and monotypy.)

"Τρόπας, a keel, and κράνος, a helmet." (Sclater.)

New name for *Ortholophus* Ogilvie-Grant, 1892, not *Ortholophus* Bigot, 1882.

**Tschagroides** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 248.

Type, *Malaconotus australis* A. SMITH.

[Laniidae.]

(Original designation.)

**Tychaëdon** C. W. RICHMOND, Proc. U. S. Nat. Mus., 53, No. 2221, Aug. "16" (=25), 1917, 575.

Type, *Cossypha signata* SUNDEVALL.

[Turdidae.]

(Original designation and monotypy.)

New name for *Aedonopsis* Sharpe, 1883, not Rey, 1872.

"Τύχη, a chance, luck; +Aëdon, ἀηδών, nightingale." (Richmond.)

†**Urmionis** MECQUENEM, "Ann. d'hist. nat. I. Paléont. Paris 1908. 54."

Type, ———, ?<sup>38</sup>

[Phoenicopteridae.]

**Vavasouria** C. CHUBB, Bull. Brit. Orn. Club, XL, No. CCXLIX, March 31, 1920, 107.

Type, *Ampelis nivea* BODDAERT=*Ampelis alba* HERMANN.

[Cotingidae.]

(Original designation and monotypy.)

**Veles**<sup>39</sup> O. BANGS, Proc. New England Zool. Club, VI, Oct. 31, 1918, 92.

Type, *Caprimulgus binotatus* BONAPARTE.

[Caprimulgidae.]

(Original designation and monotypy.)

**Vestitaria** ex "Sh.", F. P. JAROCKI, Zoologia, II, 1821, 75. (See Mathews and Iredale, Austral Avian Record, III, 1918, 144.)

Type, *Certhia coccinea* GMELIN.

[Drepanididae.]

(Monotypy.)

**Vetula** F. P. JAROCKI, Zoologia, II, 1821, 36. (See Mathews and Iredale, Austral Avian Record, III, 1918, 143.)

Type, *Cuculus vetula* GMELIN.

[Cuculidae.]

(Monotypy.)

**Vibrissosylvia** O. NEUMANN, Journal für Orn., 68 Jahrg., Heft 1, Jan., 1920, 78.

Type, *Callene cyornithopsis* SHARPE.

[Turdidae.]

(Original designation and monotypy.)

**Vidgenia** G. M. MATHEWS, Birds Australia, VII, Pt. IV, Dec. 19, 1918, 311, 327.

Type, *Cuculus castaneiventris* GOULD.

[Cuculidae.]

(Original designation.)

<sup>37</sup>Mr. Sclater (Bull. Brit. Orn. Club, XLII, p. 44) says no type was designated by Ogilvie-Grant, and that he proposes "to designate as the type of the genus *Ortholophus cassini* Finsch, which appears in the Catalogue under the name *O. alboristatus*, but which is not the bird described under that name by Cassin." Regardless of the shifting of specific names in the two species enumerated by Ogilvie-Grant, it may be said that the type of the genus *Ortholophus* was designated by Sharpe in 1893 (Zool. Record, Aves., XXIX, 1893 p. 42) as "*alboristatus*" of the Cat. Birds B. M., XVII, p. 425, and the same species was indicated by me as the type in 1902 (Proc. U. S. Nat. Mus., XXIV, p. 701). This species is the one Mr. Sclater designates under the name of *cassini*.

<sup>38</sup>No species is mentioned by Lambrecht (Fossilium Catalogus, I, Pars 12, Aves, 1921, p. 23), from whose work the reference was taken.

<sup>39</sup>Misprinted *Peles*, in Auk, 1919, 304.

**Warsanglia** S. CLARKE, Bull. Brit. Orn. Club, XL, No. CCXLVI, Dec. 31, 1919, 48.

Type, *Warsanglia johannis* CLARKE.

[Fringillidae.]

(Monotypy.)

**Xanthoplectes** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 270.

Type, *Hyphantornis xanthopterus* FINSCH and HARTLAUB.

[Ploceidae.]

(Original designation.)

(Subgenus of *Hyphantornis*, of authors, not of Gray, 1844.)

**Xanthorhynchus** A. ROBERTS, Annals Transvaal Museum, VIII, Pt. 4, Oct. 30, 1922, 214.

Type, *Buceros leucomelas* LICHTENSTEIN.

[Bucerotidae.]

(Original designation and monotypy.)

**Xenicopsoides** C. B. CORY, Auk, XXXVI, No. 2, April, 1919, 273.

Type, *Anabazenops variegaticeps* SCLATER.

[Furnariidae.]

(Original designation.)

(Subgenus of *Xenicopsis*.)

**Zoonavena** G. M. MATHEWS, Birds Australia, VII, Pt. III, August 26, 1918, 265.

Type, *Chaetura grandidieri* SCHLEGEL.

[Micropodidae.]

(Original designation and monotypy.)



CATALOGUE OF GENERA MENTIONED IN THE FOREGOING LIST, ARRANGED  
BY FAMILIES.

[Fossil genera are here indicated by italics.]

INCERTAE SEDIS.

*Fontinalis*.  
*Gigantornis*.  
*Palæochenoides*.

AEGYPTIIDAE.

*Neogyps*.  
*Neophrontops*.

ALAUDIDAE.

*Africorys*.  
*Anacorys*.  
*Croteoptera*.  
*Neomirafra*.  
*Sabota*.

ALCEDINIDAE.

*Antisyma*.  
*Argyroceyx*.  
*Cecilia*.  
*Ceycalcyon*.  
*Ceycoides*.  
*Chelicutona*.  
*Cyanoceyx*.  
*Dacelalcyon*.  
*Dilazula*.  
*Dilazulena*.  
*Edquista*.  
*Haleyonopa*.  
*Hyposyma*.  
*Ispidella*.  
*Lazulena*.  
*Leucalcyon*.  
*Melanalcyon*.  
*Nutchera*.  
*Plesialcyon*.  
*Pseudhalecyon*.  
*Todalcyon*.

ALCIDAE.

*Aethia*.  
*Psittacula*.

ANATIDAE.

*Afranas*.  
*Chenogeranus*.  
*Eider*.  
*Euolor*.  
*Horizonetta*.  
*Hygrobates*.

ANATIDAE—Continued.

*Melananas*.  
*Micronetta*.  
*Neochen*.  
*Notonetta*.  
*Perissonetta*.  
*Pileata*.  
*Pseudotadorna*.

ANHINGIDAE.

*Notoplotus*.

ARCHAEOPTERYGIDAE.

*Archaeornis*.

ARDEIDAE.

*Afrardea*.  
*Botaurites*.  
*Butor*.

ATRICHORNITHIDAE.

*Rahcinta*.

BUBONIDAE.

*Athenoptera*.  
*Berneyornis*.

BUCCONIDAE.

*Barbaculus*.

BUCEROTIDAE.

*Baryrhynchus*.  
*Cranobrontes*.  
*Nototoeckus*.  
*Platycorax*.  
*Tropicranus*.  
*Xanthorhynchus*.

BUTEONIDAE.

*Aerospiza*.  
*Anomalaetus*.  
*Cassinaëtus*.  
*Hamirostra*.  
*Helicolestes*.  
*Melanaetus*.  
*Melanocircus*.  
*Micraetus*.  
*Milvulus*.  
*Morphnarchus*.  
*Neonius*.  
*Nesobaza*.  
*Oroaëtus*.  
*Percnohierax*.

## BUTEONIDAE—Continued.

Phæoaëtus.  
Praedo.  
Pseudocircus.  
Smithaetus.  
Stephanaoëtus.

## "CACATUIDAE".

(See Kakatoëidae.)

## CAMPEPHAGIDAE.

Celebesia.  
Perissolalage.

## CAPITONIDAE.

Buccanodon.  
Micropogonius.  
Notopogonius.

## CAPRIMULGIDAE.

Crotema.  
Eximiornis.  
Microsiphonorhis.  
Nycticircus.  
Nyctictypus.  
Nyctisyrigmus.  
Rossornis.  
Veles.

## CERTHIIDAE.

Cormobates.

## CHARADRIIDAE.

Afraegialis.  
Cranellus.  
Nesoceryx.

## CLARAVIIDAE.

Amoropelia.  
Diopezus.

## COLUMBIDAE.

Afropelia.

## CONOPOPHAGIDAE.

Pseudoconopophaga.

## CORACIIDAE.

Eucoracias.  
Trimenornis.

## CORVIDAE.

Melanopica.  
Nesocorax.  
Toenia.

## COTINGIDAE.

Calloprocnias.  
Vavasouria.

## CRACIDAE.

Alector.

## CRATEROPODIDAE.

(See Turdoididae.)

## CUCULIDAE.

Adamatornis.  
Adetococeyx.  
Cecrastes.  
Grillia.  
Malcoha.  
Megacentropus.  
Melanolophus.  
Notococeyx.  
Surniculoides.  
Vetula.  
Vidgenia.

## CURSORIIDAE.

Microcursorius.  
Pratincola.  
Smutsornis.

## CYCLOPSITTACIDAE.

Cruopsitta.

## DENDROCOLAPTIDAE.

Dendrocinlopa.

## DICAЕIDAE.

Dipardalotus.

## DIOMEDEIDAE.

Rhothonia.

## DOMICELLIDAE.

Nannopsittacus.  
Parvipsitta.  
Suavipsitta.

## DREPANIDIDAE.

Dysmorodrepanis.  
Vestiaria.

## FALCONIDAE.

Cuvieria.  
Megacerchneis.  
Neohierax.

## FORMICARIIDAE.

Dichropogon.  
Frederickena.  
Hypocnemoides.  
Mackenziaena.  
Monacula.  
Neorhophias.  
Picrotes.  
Poliolæma.  
Sakesphorus.  
Stictomyrmornis.

## FREGATIDAE.

Parvifregata.

## FRINGILLIDAE.

Caffropasser.  
Chlorindus.

## FRINGILLIDÆ—Continued.

Dendrospiza.  
 Duncanula.  
 Idiospiza.  
 Lormarinsia.  
 Megapasser.  
 Menellia.  
 Microphila.  
 Microserinus.  
 Nemospiza.  
 Ochrospiza.  
 Onychostruthus.  
 Pitalla.  
 Pronospiza.  
 Psammospiza.  
 Pseudosicalis.  
 Pycnorhinus.  
 Pyrrhia.  
 Richmondena.  
 Serinops.  
 Thryospiza.  
 Warsanglia.

## FURNARIIDÆ.

Euphilydor.  
 Eusiptornoides.  
 Hylocryptus.  
 Pœcilurus.  
 Pseudosiptornis.  
 Siptornoides.  
 Siptornopsis.  
 Xenicopsoides.

## GRACULIDÆ.

Graculæa.

## HELIORNITHIDÆ.

Pteropus.

## HERMOSIORNIDÆ.

*Hermosiornis*.  
*Procariama*.

## HIRUNDINIDÆ.

Cheimonornis.  
 Natalornis.  
 Neophedina.  
 Phœnichelidon.  
 Pseudhirundo.

## HYDROBATIDÆ.

Pacificodroma.

## ICTERIDÆ.

Demeliotæucus.  
 Notiopsar.

## INDICATORIDÆ.

Melipodagus.

## IRENIDÆ.

(See Pycnonotidae.)

## IRRISORIDÆ.

(See Phœniculidae.)

## KAKATOËIDÆ.

Callocorydon.  
 Chæneirhynchus.  
 Eucacatua.

## LANIIDÆ.

Brubru.  
 Calophoneus.  
 Coracornis.  
 Diplophoneus.  
 Lanioides.  
 Neofiscus.  
 Neolanius.  
 Tschagroides.

## LARIDÆ.

Caturates.

## LEPTOSOMATIDÆ

Cromba.

## LORIIDÆ.

(See Domicellidae.)

## MELIPHAGIDÆ.

Amoromyza.  
 Orodytes.  
 Sugomel.

## MEROPIDÆ.

Micromerops.

## MICROPODIDÆ.

Alterapus.  
 Caffrapus.  
 Chæturellus.  
 Colletoptera.  
 Epicypselus.  
 Indicapus.  
 Neafrapus.  
 Notafrapus.  
 Papuanapus.  
 Tachymarptis.  
 Telacanthura.  
 Zoonavena.

## MOTACILLIDÆ.

Afranthus.  
 Aguimpia.  
 Anomalanthus.  
 Atolmodytes.  
 Caffranthus.  
 Hemimacronyx.  
 Meganthus.  
 Petranthus.  
 Psomophilus.

## MUSCICAPIDÆ.

Chloropetella.  
 Erannornis.



## MUSCICAPIDAE—Continued.

Gennæodryas.  
Haganopsornis.  
Haplornis.  
Lioptilornis.  
Mastersornis.  
Monarchanax.  
Myioparus.  
Papualestes.  
Penemonarcha.  
Penecenanthæ.  
Peneothello.  
Plesiodryas.  
Proseisura.

## MUSOPHAGIDAE.

Crinifer.

## NECTARINIIDAE.

Aethocinnyris.  
Anthophagus.  
Baptothorax.  
Eremicinnyris.  
Eucinnyris.  
Gunningia.  
Lamprothreptes.  
Maricornis.  
Microcinnyris.  
Notiocinnyris.  
Sclaterornis.  
Shelleyia.

## OEDICNEMIDAE.

Burhinops.

## ORIOOLIDAE.

Neomimeta.

## OTIDIDAE.

Microtis.

## PARADISAEIDAE.

Mathewsiella.

## PARIDAE.

Remiz.

## PELECANIDAE.

Metapelecanus.  
Neopelecanus.

## PELECANOIDIDAE.

Pelagodyptes.  
Porthmornis.

## PERISTERIDAE.

(See Claraviidae.)

## PHALACROCORACIDAE.

Anacarbo.  
Pseudocarbo.

## PHASIANIDAE.

Dendroperdix.  
Neocalophasis.

## PHOENICOPTERIDAE.

*Urmicornis*.

## PHOENICULIDAE.

Phoeniculus.

## PICIDAE.

Cirropicus.

Notopicus.

## PIPRIDAE.

Massornis.

## PLOCEIDAE.

Euploceus.

Glaucestrilda.

Mandingoa.

Microplectes.

Plesiositagra.

Tavistocka.

Xanthoplectes.

## PODARGIDAE.

Celuro.

Euægotheles.

## PRIONOPIIDAE.

Eressornis.

Knestrometopon.

Phaidrometopon.

## PROCELLARIIDAE.

(See Hydrobatidae.)

## PSITTACIDAE.

Chapmania.

Clarkona.

Eupsittacula.

Eupsittacus.

Gymnopsittacus.

Hemipsittacus.

Layardiella.

Micropsittacus.

Notopsittacus.

Proconurus.

Propyrrhura.

Salvatoria.

## PTEROCLIDAE.

Calopteroles.

Eremialector.

Nyctiperdix.

## PTEROPTOCHIDAE.

(See Rhinocryptidae.)

## PUFFINIDAE.

Oestrelatella.

## PYCNONOTIDAE.

Ayresillas.

Cophixus.

Glaucomorpha.

Harringtonia.

Sclaterillas.

## RALLIDAE.

Hapalocrex.  
 Limnocrex.  
 Nesotrochis.  
 Schoenocrex.  
*Thiornis*.  
 Thryocrex.

## REGULIIDAE.

Ocelletus.

## RHEIDAE.

*Heterorhea*.

## RHINOCRYPTIDAE.

Teledromas.

## SCOLOPACIDAE.

Capella.  
 Neoglottis.

## SITTIDAE.

Arctositta.  
 Cyanositta.  
 Homositta.  
 Leptositta.  
 Mesositta.  
 Micrositta.  
 Poecilositta.  
 Poliositta.

## SPHENISCIDAE.

Molinaea.  
*?Orthopteryx*.

## SPIZIXIDAE.

(See Pycnonotidae.)

## STURNIDAE.

Buphagoides.  
 Lamprospreo.  
 Notopholia.

## SYLVIIDAE.

Cafrillas.  
 Devisornis.  
 Drymodytos.  
 Eremomeloides.  
 Ficara.  
 Magalilais.  
 Megathiza.  
 Neocisticola.  
 Nephelicola.  
 Palaeolais.  
 Phaeorhadina.  
 Priniops.  
 Pseudhemipteryx.  
 Rhathmodyta.  
 Salicaria.  
 Sathrocercus.

## SYLVIIDAE—Continued.

Subacanthiza.  
 Tachydyta.  
 Threnetes.  
 Threnodyta.  
 Threnodytops.

## TANAGRIDAE.

Bangsia.  
 Cardinalis.  
 Cnemathraupis.  
 Cnemoscopus.  
 Habia.  
 Lorientus.  
 Oinobas?  
 Orospingus.

## TIMALIIDAE.

Alcippornis.  
 Curzonja.  
 Nigravis.  
 Sterrhoptilus.  
 Suaheliornis.

## TINAMIDAE.

Crypturornis.  
 Microcrypturus.  
*Tinamisornis*.

## TRERONIDAE.

Compsocenas.  
 Lamprura.  
 Neoleucotreron.

## TROCHILIDAE.

Agapetornis.  
 Agyrtrina.  
 Anopetia.  
 Apatelosia.  
 Arenella.  
 Bombornis.  
 Brabournea.  
 Chionomesa.  
 Chloropogon.  
 Chlorostola.  
 Chlorurania.  
 Chlorurisca.  
 Coeliola.  
 Cosmorhipis.  
 Cyanolampis.  
 Gnaphocercus.  
 Haplophædia.  
 Heteroglaucis.  
 Hypochionis.  
 Leuconympha.  
 Lithiophanes.

## TROCHILIDAE—Continued.

(Litiophana).  
Piocereus.  
Prodosia.  
Pseudocœligena.  
Pseudodiphlogæna.  
Pseudohomophania.  
Selatopogon.  
Simonula.  
Smaragdochroa.  
Taphrolesbia.  
Tephrolesbia.  
Tephropsilus.

## TURDIDAE.

Afrocichla.  
Caffronis.  
Campicoides.  
Colonocichla.  
Hyloaëdon.  
Karrucinclla.  
Keartlandia.  
Leachena.  
Notiocichla.  
Petrornis.

## TURDIDAE—Continued.

Phoenicuroides.  
Psammocinclla.  
Pseudoturdus.  
Sciocinclla.  
Swynnertonla.  
Tychaëdon.  
Vibrissosylvia.

## TURDOIDIDAE.

Achaetops.  
Maclennania.  
Papuorthonyx.

## TURNICIDAE.

Marianornis.

## TYRANNIDAE.

Cometornis.  
Microcochlearius.  
Muscifur.  
Notorchilus.  
Spizitornis.

## ZOSTEROPIDAE.

Kubaryum.  
Rukia.



# FORAMINIFERA OF THE GENUS EHRENBURGINA AND ITS SPECIES<sup>1</sup>

By JOSEPH A. CUSHMAN  
*Of Sharon, Massachusetts*

In 1850 Reuss erected the genus *Ehrenbergina* and for its genotype described the species *E. serrata* Reuss from the Miocene of Austria. *Ehrenbergina* is a genus related to *Cassidulina* and other genera of the calcareous group which have been included in the Textulariidae, in its biserial arrangement of the chambers but is clearly distinct in the peculiar plan of development. It is definitely known as far back as the Upper Eocene of America by a single species. Chapman has figured and described a form referred by him to *Ehrenbergina pupa* (d'Orbigny) from the Cretaceous of England, but it seems from the figure given to have very little relation to true *Ehrenbergina*.

It seems to be indicated that the genus may have been developed in American waters in the Upper Eocene and then became widely distributed in the Miocene at least. Records are very scattered and Reuss' species and one from Australia from the Miocene are the only ones from that formation and none are known from the Pliocene. There are a few records from the Pleistocene, all from the Pacific and Antarctic. As a recent genus it is well distributed in the Indo-Pacific and the tropical western Atlantic but most abundant in the Pacific. There are several distinct species in the present oceans with very definite distributions.

## Genus EHRENBURGINA Reuss, 1850

*Ehrenbergina* REUSS (type *E. serrata* Reuss), Denkschr. Akad. Wiss. Wien, vol. 1 1850, p. 377.—H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 433.—CHAPMAN, The Foraminifera, 1902, p. 179.—CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 101; Bull. 104, pt. 3, 1922, p. 133.  
*Cassidulina* (part) d'ORBIGNY, Foram. Amér. Méri., 1839, p. 57.

Test free, composed of numerous chambers arranged biserially about an elongate axis with a definite dorsal and ventral side, the dorsal with the chambers meeting evenly and alternating, the surface usually smooth, the ventral side usually with a central groove and the

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<sup>1</sup>This is the second of a contemplated series of revisions of the genera of Foraminifera by Dr. J. A. Cushman. The first appeared as No 2597, of the Proceedings of the United States National Museum, vol. 67, 1926, art. 25, pp. 1-24, with pls. 1-6: "Foraminifera of the Genera Siphogenerina and Pavonina."

chambers ornamented; test in transverse section roughly triangular, the ventral side forming two sides and the apex of a triangle; wall calcareous, perforate; aperture elongate, nearly at right angles to the edge of the chamber; surface smooth or ornamented with spines or ridges.

#### SPECIES FROM THE EOCENE

##### *EHRENBERGINA SEMMESI*, new species

Plate 1, fig. 1

Test small, in front view somewhat rhomboid; chambers few, distinct; sutures very slightly depressed on the ventral side, not at all so on the dorsal side; periphery with distinct, solid, acicular spines on the angles of the last four chambers; surface smooth except the margins of the last few chambers on the ventral side, which are thickened; test in section biconvex; aperture elongate.

Length 0.40 mm.; breadth with spines 0.50 mm.

Holotype (Cushman Coll. No. 1595) from Alazan Clay, km. 66 on Mexican Oil Fields R. R., Cazonas River, Mexico, collected by D. R. Semmes.

This species has already developed the spinose character of the periphery, more strongly so than others until the Pleistocene and Recent species are seen.

#### SPECIES FROM THE MIOCENE

##### *EHRENBERGINA SERRATA* Reuss

Plate 1, figs. 2a-c

*Ehrenbergina serrata* REUSS, Denkschr. Akad. Wiss. Wien, vol. 1, 1850, p. 377, pl. 48, figs. 7a-c.

Test small, broadly ovate in front view, chambers numerous, mostly rather low and broad, increasing in height in the adult, sutures on the ventral side depressed, on the dorsal side flush with the surface; periphery serrate, the outer edge of the chamber thin and carinate with the posterior angle slightly produced; surface smooth; aperture elongate, slightly curved.

The types of this species are from the Miocene of Austria.

Many authors have referred specimens to this species of Reuss, but a comparison of the figures will show them to be very different.

#### SPECIES FROM THE PLEISTOCENE

##### *EHRENBERGINA BICORNIS* H. B. Brady

Plate 1, figs. 5a, b

*Ehrenbergina bicornis* H. B. BRADY, Quart. Journ. Geol. Soc., vol. 44, 1888, p. 5, pl. 1, figs. 3a, b.

"Test subspherical, regularly biserial, earlier portion helicoid; margin entire; armed with two stout spines, one at each side, directed outwards."

"This is a curious modification of the Cassiduline type, somewhat allied to *Ehrenbergina hystrix*, the short scattered spines of which are replaced by two long processes, one at each lateral margin, protruding at right angles to the longer diameter of the shell. The segmentation is exceedingly regular and the septal lines are scarcely, if at all, depressed."

This species was described from the Pleistocene of Suva, Fiji, and also recorded from New Ireland in the Bismarck Archipelago.

#### EHRENBURGINA FOVEOLATA Schubert

Plate 1, figs. 3, 4

*Ehrenbergina foveolata* SCHUBERT, Abhandl. geol. Reichsanst., vol. 20, pt. 4, 1911, p. 61, pl. 6, fig. 1a-f.

The figures of this species are from photographs of specimens taken out of the Pleistocene rock from the Bismarck Archipelago. They are generally triangular in front view with spinose projections, evidently more than one on a side and the striking character is the surface ornamentation which consists of fine polygonal reticulations.

Length 0.30–0.50 mm., breadth 0.50–0.60 mm.

The types are from Panaras and Suralil, Middle New Mecklenburg in the Bismarck Archipelago.

The species is evidently related to *E. bicornis* H. B. Brady, and *E. hystrix* H. B. Brady, but the surface ornamentation makes it very distinct from any other known species.

#### LIVING SPECIES

#### EHRENBURGINA HYSTRIX H. B. Brady

Plate 1, figs. 6a, b

*Ehrenbergina hystrix* H. B. BRADY, Quart. Journ. Micr. Sci., vol. 21, 1881, p. 60; Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 434, pl. 55, figs. 8–11.—FLINT, Bull. 55, U. S. Nat. Mus., 1905, pp. 16, 19.—CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 102, text figs. 156a–d.—HERON-ALLEN and EARLAND, British Antarctic Exped., Zoology, vol. 6, 1922, p. 140.

Test about as broad as long; chambers few, periphery with a stout spine from the middle of each chamber, those of the earlier chambers of the coiled portion scattered over that part of the ventral surface; sutures on the dorsal side somewhat thickened but not elevated, on the ventral side depressed; wall thick and heavy; aperture elongated, curved, with numerous costae on the surface arranged in a radial manner about it.

Length up to 1 mm.

The type specimens are from the South Pacific. The known distribution is in the tropical Pacific from lat. nearly 140° W. to nearly 140° E., and extending barely beyond the Tropics. An exception to

this are the specimens recorded by Heron-Allen and Earland from the Antarctic south of New Zealand. The average of all known records gives about 2,000 fathoms. It is interesting that a species of such deep water should be limited to this Pacific area. It is the largest and finest species of the genus.

**EHRENBURGIA HYSTRIX** H. B. Brady, var. **GLABRA** Heron-Allen and Earland

Plate 1, figs. 7, 8

*Ehrenbergina hystrix* H. B. BRADY, var. *glabra* HERON-ALLEN and EARLAND, British Antarctic Exped., Zoology, vol. 6, 1922, p. 140, pl. 5, figs. 1-6, 11.

Variety differing from the typical in having the early chambers smooth, without the spines of the typical form, the aperture nearer the marginal edge of the face and the costae about the aperture wanting or nearly so.

Length 0.35-0.60 mm., breadth with spines up to 0.60 mm., thickness up to 0.30 mm.

The types are from the Antarctic collections of the *Terra-Nova* expedition.

It should be noted that some of the figures such as plate 5, figures 3 and 5, very strongly suggest that Chapman's specimens from the Pleistocene of the Antarctic<sup>2</sup> may belong to this newly described variety from the waters of the same locality.

**EHRENBURGIA MESTAYERI** Cushman

Plate 1, fig. 9

*Ehrenbergina mestayeri* CUSHMAN, Bull. 104, U. S. Nat. Mus., pt. 3, 1922, p. 135. *Ehrenbergina serrata* CHAPMAN (not Reuss), Journ. Linn. Soc. Zool., vol. 30, 1907, p. 33, pl. 4, figs. 85-87; (?) Rep't. Subantarctic Islands, New Zealand, 1909, p. 332, pl. 15, fig. 2.

Test roughly triangular, apertural end broadly curved; chambers numerous on the dorsal side, smoothly fitting, on the ventral side coming together to form a raised smooth area, broadening toward the apertural end but extending to the initial end; apertural angles of the chambers with short, usually blunt, spines; sutures depressed on the ventral side, not at all depressed on the dorsal side; aperture an elongated curved slit, nearly at right angles to the inner margin of the chamber, somewhat more rounded and wider at the outer end; color white.

Length up to 0.50 mm.

Type specimens from off the Poor Knights Islands, east coast of New Zealand, are in the collections of the U. S. National Museum. I have also specimens collected by Mr. Mestayer in 60 fathoms off the Poor Knights Islands, in 98 fathoms off the Big King, and 75

<sup>2</sup>British Antarctic Exped., Geol., vol. 2, 1916 (1917), pl. 2, fig. 16.

fathoms off North Cape, New Zealand. There are numerous records for *E. serrata* in this region some of which at least may be *E. mestayeri*.

The peculiar fused central region of the ventral side is very distinctive.

Specimens from the Miocene of the Filter Quarries, Batesford, Victoria, are very close to if not identical with this species.

Chapman has very recently<sup>3</sup> figured a specimen from the Upper Eocene of New Zealand which he refers to *Ehrenbergina serrata* Ehrenberg. While the figured specimen has spines on the central ventral portion, it appears otherwise very much like *E. mestayeri* and it may be suspected that *E. mestayeri* developed from such a form by the loss of the spines. The size is very close also.

#### EHRENBURGINA BRADYI Cushman

Plate 2, figs. 1a-c

*Ehrenbergina serrata* H. B. BRADY (part) (not Ruess), Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, pl. 55, figs. 2, 3, 5 (?) (not 4, 6, 7).—CUSHMAN, Bull. 104, U. S. Nat. Mus., pt. 3, 1922, p. 134, pl. 26, fig. 5.

Test triangle, chambers numerous, dorsal side nearly flat, with the sutures broad but not raised; ventral side with a median furrow with a series of fine spines at the inner angles of the chambers and fine downwardly pointing spines on the peripheral angles; in end view with the dorsal side forming the base of a triangle which is truncated on the ventral side; aperture elongate.

Length up to 0.60 mm.

The figure and description in my Atlantic paper do not correspond owing to an error and I am trying here to correct this. *E. bradyi* Cushman should be applied to those specimens with finely spinose basal angles as in Brady's plate 55 (figs. 2 and 3), and as I have figured.<sup>4</sup> Plate 55, figures 6 and 7 of Brady should be referred to the following species:

#### EHRENBURGINA PACIFICA, new species

Plate 2, figs. 2a-c

*Ehrenbergina serrata* H. B. BRADY (part) (not Reuss), Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, pl. 55, figs. 6, 7, 4 (?) (not 2, 3, 5(?)).—CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 2 1911, p. 101, figs. 155a, b.

Test triangular in front view, chambers numerous, low and broad, dorsal side convex, ventral side with a narrow median furrow which may be entirely closed; sutures distinct, on the dorsal side flush with the surface, on the ventral side depressed; periphery with long

<sup>3</sup>New Zealand Geol. Surv., Pal. Bull. No. 11, 1926, p. 43, pl. 9, fig. 16.

<sup>4</sup>Bull. 104, pl. 3, 1922, pl. 26, fig. 5.



spinose processes from the upper angle of each chamber extending straight out from the test, each chamber with the ventral angle having a raised ridge continuing to the spine at the periphery; aperture elongate, narrow.

Length up to 0.60 mm.

Brady's specimens referred to in the above reference were from *Challenger* station 192 off the Ki Islands. I have had the species from numerous stations in the Pacific where it is common.

**EHRENBURGINA TRIGONA Goës**

Plate 2, fig. 3

*Textularia triquetra* Goës (not von Münster), Kongl. Svensk. Vet. Akad. Handl., vol. 19, No. 4, 1882, p. 83, pl. 6, figs. 183, 184.

*Ehrenbergina serrata* REUSS, var. *trigona* Goës, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 49.

*Ehrenbergina trigona* CUSHMAN, Bull. 104, U. S. Nat. Mus., pt. 3, 1922, p. 135, pl. 26, fig. 4.

Test roughly triangular in front view, dorsal side slightly curved or plane, ventral side with or without a central furrow, the peripheral angles slightly spinose, the projections pointing downward; sutures distinct, not depressed on the dorsal side, only slightly so on the ventral side; the ventral angle of the chambers with a slight raised ridge; aperture elongate, curved.

Length 0.40 mm.

*Ehrenbergina trigona* Goës may be used for those specimens of the Western Atlantic which have a decided trigonal form, the slightly thickened edges to the chambers and the spinose projections pointing downward. It is represented off the coast of Brazil by the following variety:

**EHRENBURGINA TRIGONA Goës, var. BRAZILIENSIS Cushman**

Plate 2, figs. 4 a, b.

*Ehrenbergina trigona* Goës, var. *braziliensis* CUSHMAN, Bull. 104, U. S. Nat. Mus., pt. 3, 1922, p. 136, pl. 26, figs. 1-3.

Test differing from the typical in having the test much more compressed, the whole being very thin and broad, the angles at the sides well developed and spinose, usually with numerous short spines below the main one at the angle, the early portion of the test often covered with numerous short spinose processes; wall rather coarsely perforate, test translucent.

The types of this variety (Cat. No. 16395, U.S.N.M.) are from off Brazil in 417 fathoms. The very flat form with peculiar roughened angles are distinctive.

## EHRENBURGIA PUPA (d'Orbigny)

## Plate 2, figs. 5, 6

*Cassidulina pupa* d'ORBIGNY, Foram. Amér. Mérid., 1839, p. 57, pl. 7, figs. 21-23.  
*Ehrenburgina pupa* H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 433, pl. 55, figs. 1a, b; pl. 113, figs. 10a-c.—CHAPMAN Journ. Linn. Soc. Zool., vol. 30, 1910, p. 406.—PEARCEY, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1016.—CHAPMAN, Rep't. British Antarctic Exped., Geol., vol. 2, 1916 (1917), p. 31, pl. 2, figs. 15a, b.—CUSHMAN, Bull. 104, U. S. Nat. Mus., pt. 3, 1922, p. 137.

Test subtriangular, broader at the apertural end, bluntly pointed at the initial end, composed of comparatively few chambers, on the dorsal side smooth and rounded, the ventral side with a slight longitudinal depression; chambers inflated, distinct, wall fairly thin, finely punctate, smooth; sutures distinct, depressed, especially on the ventral side, not forming either spines or ridges; aperture elongate, curved, nearly at right angles to the edge of the chamber.

Length 0.35 mm.

D'Orbigny's types were from the Falkland Islands. There are rather wide spread records for the species but mostly from the South Atlantic and South Pacific.

It is very distinct from all the other species of the genus in its very smooth rounded test with the absence of all ornamentation. Egger's figures<sup>5</sup> do not at all correspond with the characters of this species. It may be noted that the original figures of d'Orbigny show a more compressed form than do later figures.

Chapman<sup>6</sup> refers specimens from the Lower Cretaceous to this species. There are, however, numerous points in which his figure does not fit well with what is known of *E. pupa* and it is to be questioned if it really represents an *Ehrenburgina*.

Chapman has recently referred<sup>7</sup> Upper Eocene specimens from New Zealand to this species. The figured specimen is not clear in all its details but hardly seems referable to this species as developed in the present ocean.

A further study with a larger suite of specimens of the form that I have referred to *E. glabrata* from the Byram Marl of Mississippi<sup>8</sup> shows it to belong to the peculiar group of *Gaudryina* in which there is a slight basal triangular portion followed by a later development in which as in *Ehrenburgina* there is developed a dorsal side that is flattened and a ventral one with deeply depressed sutures.

<sup>5</sup> Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, pl. 7, figs. 43-46.

<sup>6</sup> Quart. Journ. Geol. Soc., vol. 50, 1894, p. 304, pl. 34, figs. 6a, b.

<sup>7</sup> New Zealand Geol. Surv., Pal. Bull. No. 11, 1926, p. 43, pl. 9, fig. 15.

<sup>8</sup> U. S. Geol. Survey Prof. Paper 129-E, 1922, p. 93, pl. 17, figs. 4a-c.

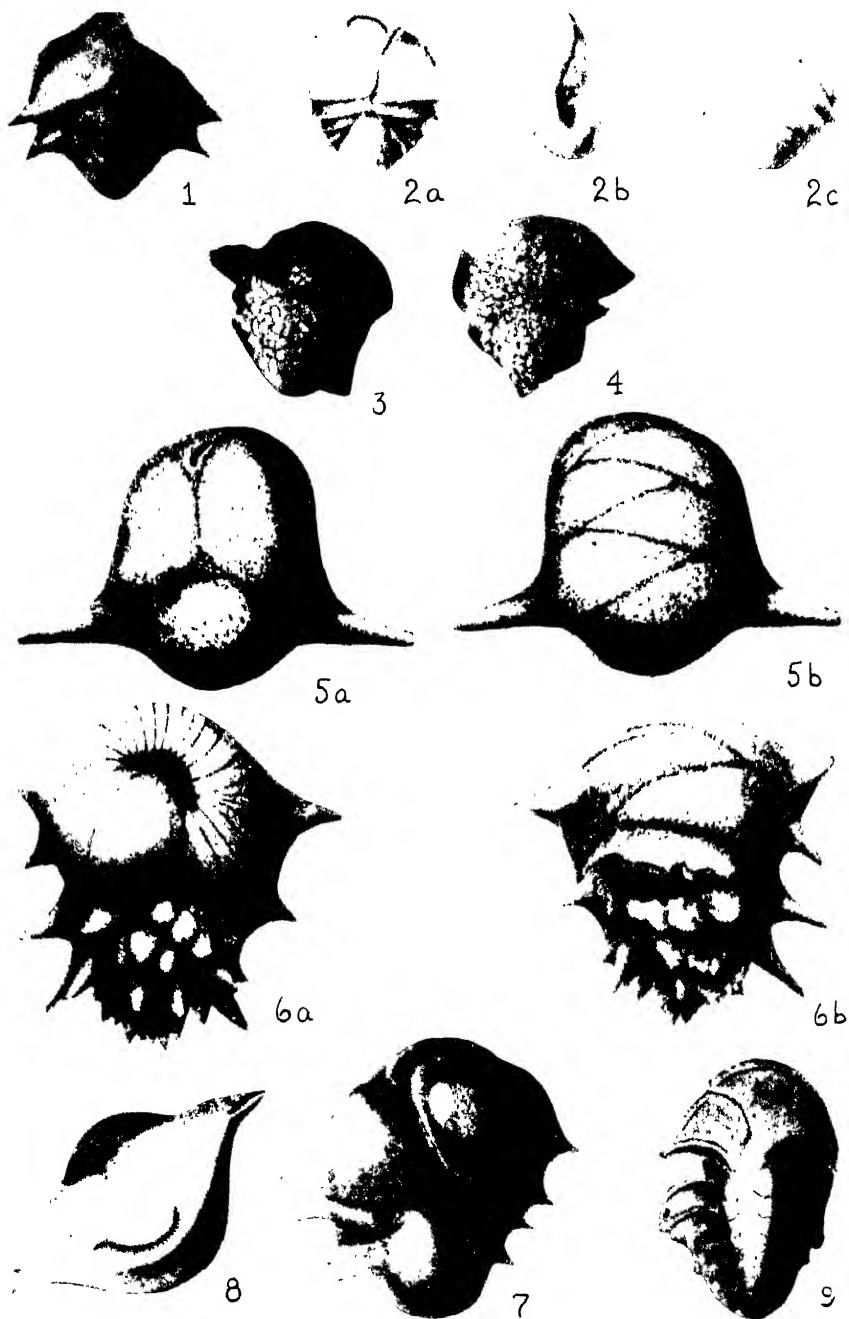
## EXPLANATION OF PLATES

### PLATE 1

- FIG. 1. *Ehrenbergina semmesi*, new species. Front view.  $\times 60$ .  
 2 a-c. *Ehrenbergina serrata* Reuss. a, ventral view; b, side view; c, dorsal view. After Reuss, type figure.  
 3, 4. *Ehrenbergina foveolata* Schubert. 3, ventral view(?); 4, dorsal view(?). After type figures of Schubert.  $\times 50$ .  
 5a, b. *Ehrenbergina bicornis* H. B. Brady. a, ventral view; b, dorsal view. After Brady's type figures.  $\times 50$ .  
 6 a, b. *Ehrenbergina hystrix* H. B. Brady. a, ventral view; b, dorsal view.  $\times 60$ . After Brady's type figures.  
 7, 8. *Ehrenbergina hystrix* H. B. Brady, var. *glabra* Heron-Allen and Earland. 5, ventral view; 6, apertural view.  $\times 60$ . After originals.  
 9. *Ehrenbergina mestayeri* Cushman. Ventral view.  $\times 60$ .

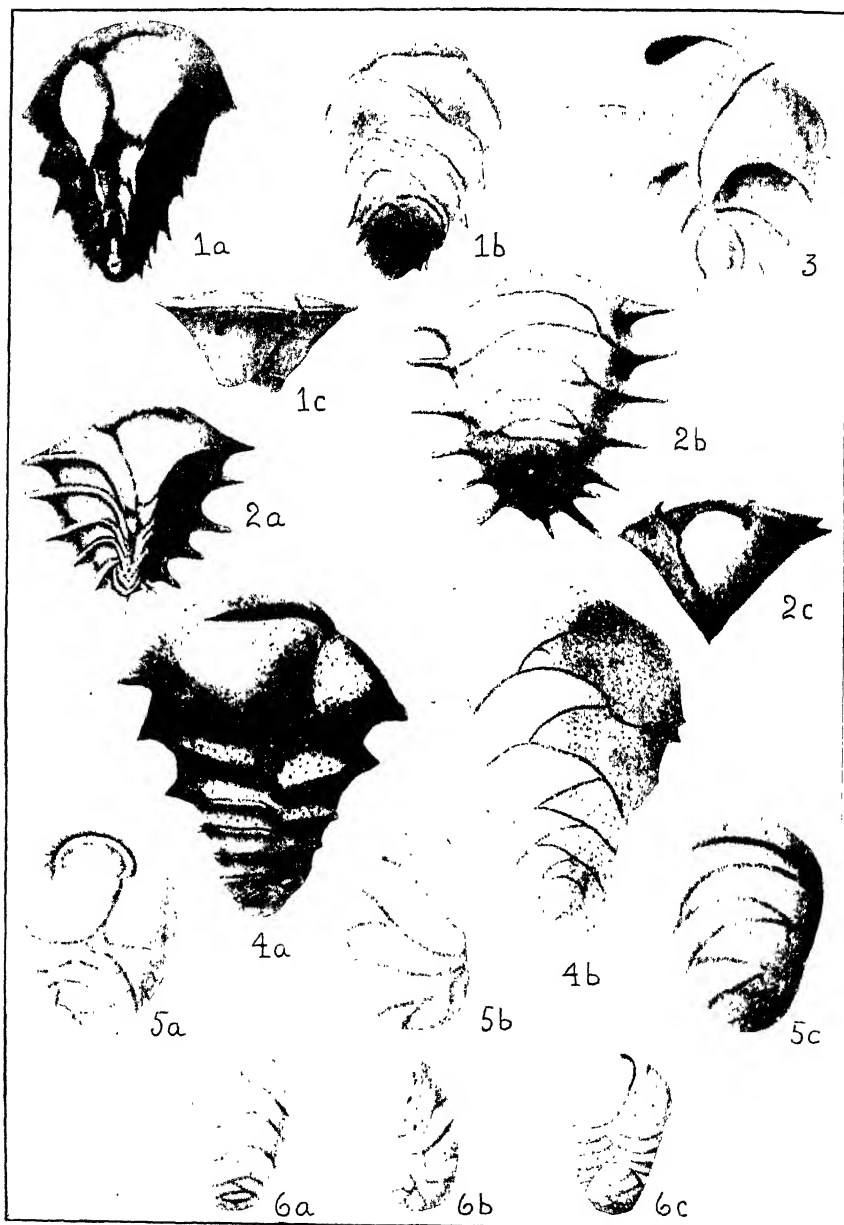
### PLATE 2

- Figs. 1a-c. *Ehrenbergina bradyi* Cushman. a, ventral view; b, dorsal view; c, apertural view.  $\times 60$ . After Brady.  
 2a-c. *Ehrenbergina pacifica* Cushman, new species. a, ventral view; b, dorsal view; c, apertural view.  $\times 60$ . After Brady.  
 3. *Ehrenbergina trigona* Goës. Ventral view.  $\times 80$ . Young specimen.  
 4a, b. *Ehrenbergina trigona* Goës, var. *braziliensis* Cushman. a, ventral view; b, dorsal view.  $\times 80$ .  
 5a-c. *Ehrenbergina pupa* (d'Orbigny). a, ventral view; b, peripheral view; c, dorsal view.  $\times 80$ . After Brady.  
 6a-c. *Ehrenbergina pupa* (d'Orbigny). a, dorsal view; b, peripheral view; c, ventral view.  $\times 75$ . After d'Orbigny's type figure.



SPECIES OF THE FORAMINIFERA GENUS EHRENBURGINA

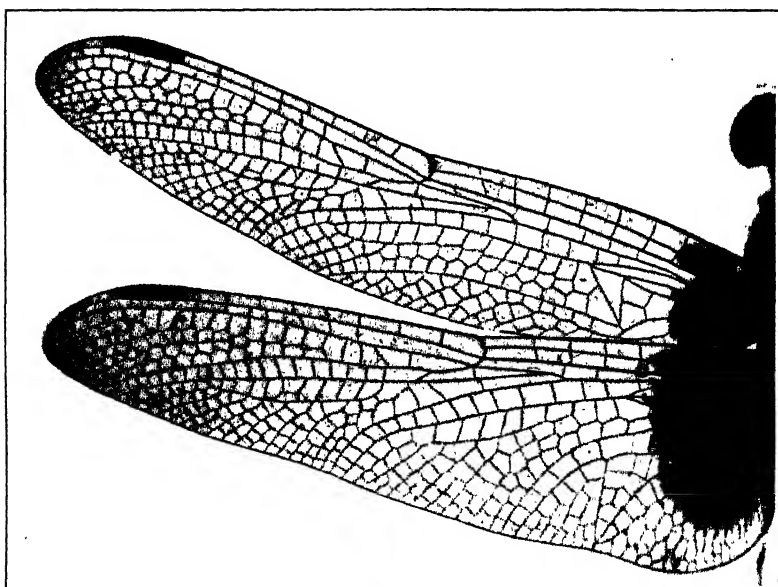
FOR EXPLANATION OF PLATE SEE PAGE 8



SPECIES OF THE FORAMINIFERA GENUS EHRENBURGINA

FOR EXPLANATION OF PLATE SEE PAGE 8





WINGS OF LEFT SIDE OF MALE UROTHEMIS ABBOTTI

FOR EXPLANATION OF PLATE SEE PAGE 2

# DESCRIPTION OF A NEW DRAGON FLY FROM LOWER SIAM BELONGING TO THE GENUS UROTHEMIS

By F. F. LAIDLAW

*Of Uffculme, England*

The new species described below belongs to the Libellulid subfamily Libellulinae. The material from which the species is described was collected by Dr. W. L. Abbott and forwarded to me for study by the United States National Museum. Since a detailed report on the oriental material of the subfamily Libellulinae can not be completed for some time it seems desirable to publish the description of this interesting new form in advance of the complete report.

## UROTHEMIS ABBOTTI, new species

*Material*.—One male (holotype). One female (allotype). Two males (paratypes).

*Data*.—Trong, Lower Siam. Dr. W. L. Abbott. (Coll. U. S. Nat. Mus.) (Specimens to be returned to U. S. National Museum.)

### *Venation*.

I. Ante and post nodal cross nerves.

$$\begin{array}{l} \frac{7-8}{7-6} \mid \frac{8-7}{6-7} \text{ holotype.} \qquad \frac{7-8}{7-6} \mid \frac{8-7}{6-7} \text{ allotype.} \\ \frac{7-8}{7-5} \mid \frac{8-7}{5-7} \text{ paratype } a. \qquad \frac{7-9}{8-6} \mid \frac{8-7}{6-7} \text{ paratype } b. \end{array}$$

II. Cell rows of discoidal field of fore wing.

Between the triangle and the beginning of *Mspl* there lie seven or eight rows of cells in this field. After the first cell the row is generally three cells deep, but in the specimen indicated as paratype *b* the row is only two cells deep, on the right side for the first six cells, on the left side for the second to the sixth cell.

*Mspl* incloses invariably a single row of cells, about six in number.

III. Rows of cells between *Rs* and *Rspl*.

Invariably two cells deep at its center, on both fore and hind wing, for a distance of one, two, or even three cells. The supplement incloses a row of nine or ten cells. It is two cells deep for a length of—

$$\begin{array}{l} \frac{1 \text{ cell}}{2 \text{ cells}} \mid \frac{2 \text{ cells}}{1 \text{ cell}} \text{ holotype.} \qquad \frac{3 \text{ cells}}{3 \text{ cells}} \mid \frac{3 \text{ cells}}{1 \text{ cell}} \text{ allotype.} \\ \frac{3 \text{ cells}}{3 \text{ cells}} \mid \frac{3 \text{ cells}}{2 \text{ cells}} \text{ paratype } a. \qquad \frac{1 \text{ cell}}{1 \text{ cell}} \mid \frac{1 \text{ cell}}{1 \text{ cell}} \text{ paratype } b. \end{array}$$



In these characters *abbotti* shows a departure from the characterization of the genus *Urothemis* as given by Dr. F. Ris in the monograph. In other respects the venation is that characteristic of the genus. Doctor Ris has examined the wing photograph, and has kindly written to me that in his opinion the differences noted above render a slight modification in the generic character necessary, but that the species is undoubtedly to be referred to *Urothemis*.

The alterations necessary in the generic definition then are as follows:

Seven or eight antenodal cross nerves in the fore wing. Between *Rs* and *Rspl* one row of cells, or for a distance of one to three cells two rows. Discoidal field of fore wing of two or three rows of cells.

Dimensions.—Length of abdomen, male, 26 mm.; female, 25 mm.; of hind wing, male, 36.5 mm.; female, 37.5 mm.

*Male—Coloring.*—Wings slightly suffused with golden-brown throughout, this coloring becoming a little more intense apically. Veins brown, the costa and subcosta lighter than the rest up to the nodus. Base of fore wing suffused with rich golden-brown; this extends to the second antenodal cross nerve, to the arculus, and to the inner angle of the internal triangle, and thence to the anal margin of the wing.

The base of the hind wing is similarly colored; the golden-brown suffusion extends from the base to about halfway between the second and third antenodal, covers the basal half of the supratriangle and triangle, and thence is continued back over the anal area of the wing, the area covered by it having a semicircular outline not reaching the anal margin. Within the suffusion there are two patches of sharply defined dark-brown coloring, the smaller covering the basal half of the supratriangle and triangle and filling the subtriangle; the second, roughly oval in outline, extends back from the neck of the "Italian loop," its antero-posterior diameter covering about three cells, its transverse, greater diameter about six cells.

Head, eyes dark brown, otherwise ochraceous, but the vesicle of the frons with a warm red tinge. Antennae black.

Prothorax apparently entirely black.

Synthorax yellowish-brown, anterior mesothoracic margin black, a small black mark on the second lateral suture; the alar sinuses and coxal sutures also black.

Abdomen red-brown, dorsum of first segment and a narrow longitudinal line on the dorsum of eighth and ninth segments black.

Anal appendages of the same color as the abdomen.

Legs, yellowish-brown; articulations, spines and tarsi very dark brown.

*Female*.—Very similar in appearance to the male. The dark color patches on the hind wing decidedly less extensive than in the male. The hinder patch is circular rather than oval in outline, and has a diameter of about 3-4 cells.

Other differences are as follows: On the head the vesicle of the frons is without any red tinge. The general color of the synthorax and abdomen is duller. Segments 3-7 have an apical dorsal mark of black, the black band on the dorsum of 8-9 is broader than in the male, and 10 has a very narrow basal ring of black. As in the male the black markings on the abdominal segment have a slightly metallic gloss.

*Genital appendages*.—The genital structures agree more closely with those of *signata* than with the African species. The appendages of the second abdominal segment of the male are very similar to those of Indian specimens of *signata*. The hamule is moderately broad and very slightly longer than the lobus. Similarly the valvulae vulvae of the female are almost exactly like those of the specimen from Calcutta figured by Dr. F. Ris in his monograph,<sup>1</sup> the only difference being that in *abbotti* the valvulae are a little longer, equaling in length the ninth segment.

A comparison with the other species of the genus suggests that in venation the species is rather nearer to the African species than to *signata*, the only other Asiatic species, whilst in other respects *abbotti* resembles its Asiatic congener rather than the African forms. It is, however, amply distinct from them all.

I have seen a much damaged example of *abbotti* from Singapore amongst material sent to me by Mr. Moulton. The range of the species would appear to be the west coast of the Malay Peninsula. One may surmise that it is an inhabitant of the mangrove swamps which form so conspicuous a feature of that coast.

The terms employed in discussing the venation of the species are those used by Dr. F. Ris in the Selysian monograph.<sup>1</sup> For the wing photo of the holotype I am indebted to Mr. F. W. Campion.

Lastly, it gives me much pleasure to associate this fine new species with the name of Dr. W. L. Abbott, by whom it was collected.

*Type, allotype, and paratype*.—Cat. No. 50247, U.S.N.M.

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<sup>1</sup> Catalogue Systématique et Descript. Collections Zoologiques du Baron Edm. de Selys-Longchamps, fasc. ix-xvi, Libellulinae par Dr. F. Ris.



SMALL SHELLS FROM DREDGINGS OFF THE SOUTHEAST  
COAST OF THE UNITED STATES BY THE UNITED  
STATES FISHERIES STEAMER "ALBATROSS" IN 1885  
AND 1886

By WILLIAM H. DALL

*Honorary Curator of Mollusks, United States National Museum*

In 1885 the United States Fisheries steamer *Albatross* made a series of dredgings along the southeastern coast of the United States. One of the stations, No. 2415, was off the coast of Georgia in north latitude  $30^{\circ} 44'$ , and west longitude  $79^{\circ} 26'$ , with a depth of 440 fathoms (948 meters), in broken coral, coarse sand, and broken shell, bottom temperature  $45.6^{\circ}$  F. ( $7.5^{\circ}$  C.).

The following year a similar dredging was made off Fernandina, Fla., at station 2668, in north latitude  $30^{\circ} 58'$  and west longitude  $79^{\circ} 38'$ , with a depth of 294 fathoms (678 meters) in gray sand and broken coral, bottom temperature  $46.3^{\circ}$  F. ( $8.2^{\circ}$  C.).

The material obtained was sifted, the larger shells taken out and the comparatively fine residue retained for its content of minute shells, foraminifera, etc. This residue was chiefly composed of fragments of the test of barnacles and echinoderms, the sand having been sifted out, and the fragments of coral, if any, removed; at all events none were found in it. Many of the contents had evidently been crushed or broken by the teeth of fishes. The pteropod remains had been derived from the surface, and very few of the other specimens had been alive when dredged. The total amount of material from off Georgia was somewhat more than a pint, and that from off Fernandina about twice as much.

Noticing that this contained many minute shells I took it home, put it on my desk, and from time to time as I had a few leisure moments, went over it, a teaspoonful at a time, and picked out the mollusks. Later when in quarantine at home on account of illness in the family, I separated these pickings and mounted the specimens for study, a work completed in 1898. Various duties compelled me to give little further attention to this material for some years. In 1920 the late John B. Henderson, jr., engaged on a monograph of the *Dentalia* of the southeast coast of the United States, utilized the

scaphopod material from this series. The references to this group in the following pages are taken from Bulletin 111 of the United States National Museum containing Mr. Henderson's excellent monograph, published in 1920.

During the summer of 1922 I was able to take up the description of the other mollusca comprised in the present paper.

To avoid tiresome repetition the material from the two dredgings is referred to herein simply as "off Fernandina" and "off Georgia," since the localities are only a few miles apart and the difference in depth only 146 fathoms, the fauna may reasonably be regarded as nearly or quite the same for both places.

I have no means of determining what were all the larger species which were removed from these dredgings before they came into my hands, but I have found records of *Aurinia gouldiana* Dall, *Drillia acrybia* Dall, *Pleurotoma dalli* Verrill, and *Triphora triserialis aspera* Jeffreys; the last from off Georgia, the others from off Fernandina.

I have omitted from the list surface forms like the Pteropods and *Williamia*, also two or three shells which are clearly adventitious.

My colleague Dr. Paul Bartsch, has kindly determined and described the Pyramidellidae of the collection, a group to which he has paid particular attention.

The total number of species in the material examined is 337. This includes 5 species of Brachiopoda, 41 Pelecypoda, 14 Scaphopoda, and 277 Gastropoda.<sup>1</sup> Of these 73 species were found at both stations, 171 only off Fernandina, and 84 only off Georgia. The difference may partly be due to the fact that the total amount of bottom material from off Georgia was only about half as much as that collected off Fernandina.

Out of the total number (337) of species collected, 204 appear to be undescribed, which gives an idea of the richness of certain localities on the sea bottom when conditions are favorable. If we add to this number 6 species of Scaphopods described by Mr. Henderson the total is still more striking.

## LIST OF THE SPECIES

### BRACHIOPODA

*Terebratulina caillieti* Crosse.  
*Gryphus cubensis* Pourtalés.  
*Gryphus affinis* Calcare.

*Dallina floridana* Pourtalés.  
*Pelagodiscus atlanticus* King.

### MOLLUSCA--PELECYPODA

*Nucula culebrensis* E. A. Smith.  
*Nucula fernandina* Dall.  
*Nucula verrillii* Dall.  
*Nucula proxima ovata* Verrill.

*Leda messanensis* Seguenza.  
*Leda oriza* Dall.  
*Leda aspecta* Dall.  
*Leda bipennis* Dall.

<sup>1</sup>These numbers refer to the species in the present paper. See for additions the Supplement on p. 115.

*Yoldiella pygmaea* Münster  
*Yoldiella fraterna* Verrill and Bush.  
*Malletia* (Neilo) *dilatata* Philippi.  
*Tindaria cytherea* Dall.  
*Tindaria acinula* Dall.  
*Pseudoglomus pompholyx* Dall.  
*Pristigloma nitens* Jeffreys.  
*Limopsis tenella* Jeffreys.  
*Limopsis minuta* Philippi.  
*Limopsis radialis* Dall.  
*Limopsis onchodes* Dall.  
*Cucullaria saginata* Dall.  
*Barbatia*, species.  
*Batharca orbiculata* Dall.  
*Batharca inaequalis* Dall.  
*Pseudamusium nanum* Verrill and Bush.  
*Propeamusium pourtalesianum* Dall.

*Limatula laminifera* E. A. Smith.  
*Limaea bronniana* Dall.  
*Poromysa granulata* Nyst and Westendorp.  
*Lyonsiella abyssicola* Sars.  
*Verticordia sequenzae* Dall.  
*Verticordia ornata* Orbigny.  
*Montacuta limpida* Dall.  
*Erycina fernandina* Dall.  
*Thyasira succisa* Jeffreys.  
*Kelliella nitida* Verrill.  
*Cuspidaria arctica* Sars.  
*Cuspidaria*, species.  
*Halonympha claviculata* Dall.  
*Astarte globula* Dall.  
*Ervilia concentrica* Gould.  
*Diplothyra smithii* Tryon.

## MOLLUSCA—SCAPHOPODA

*Dentalium ceratum* Dall  
*Dentalium tubulatum* Henderson  
*Dentalium ensiculus* Jeffreys  
*Dentalium pressum* Pilsbry and Sharp  
*Dentalium ophiodon* Dall  
*Siphonodentalium platamodes* Watson.  
*Siphonodentalium striatinum* Henderson

*Cadulus providensis* Henderson.  
*Cadulus rastridens* Watson.  
*Cadulus regularis* Henderson.  
*Cadulus acus* Dall.  
*Cadulus transitorius* Henderson.  
*Cadulus obesus* Watson.  
*Cadulus platensis* Henderson

## MOLLUSCA—GASTROPODA

*Acteon danaida* Dall.  
*Acteon incisus* Dall.  
*Acteon hebes* Verrill.  
*Acteon semicingulatus* Dall.  
*Acteon particolor* Dall.  
*Acteon juvenis* Dall.  
*Acteon liostracoides* Dall.  
*Acteon propius* Dall.  
*Acteon parallelus* Dall.  
*Acteon lacunatus* Dall.  
*Ringicula nitida* Verrill.  
*Ovulactaeon meeki* Dall.  
*Volvulella mörchi* Dall.  
*Retusa recta* Orbigny.  
*Cylichna verrillii* Dall.  
*Pyrunculus floridensis* Dall.  
*Pyrunculus rushi* Dall.  
*Pyrunculus medius* Dall.  
*Pyrunculus curtulus* Dall.  
*Bullaria indolens* Dall.  
*Leucophysema eburneola* Dall.  
*Leucophysema abyssicola* Dall.  
*Sabatia bathymophila* Dall.  
*Scaphander stigmatica* Dall.  
*Diaphana floridana* Dall.  
*Philina lucida* Dall.

*Daphnella hyperlissa* Dall.  
*Gymnobela imitator* Dall.  
*Gymnobela illicita* Dall.  
*Gymnobela lanceata* Dall.  
*Gymnobela grundifera* Dall.  
*Mangilia ipara* Dall.  
*Mangilia sericifila* Dall.  
*Mangilia*, var. *strongyla* Dall.  
*Pleurotomella stearina* Dall.  
*Pleurotomella corrida* Dall.  
*Eucyclotoma aperta* Dall.  
*Eubela limacina* Dall.  
 \* \* \* \* \*  
*Mangilia* (*Turridrupa*) *comatotropis* Dall.  
 \* \* \* \* \*  
*Pleurotomella lineola* Dall.  
 \* \* \* \* \*  
*Mangilia ischna* Dall.  
*Pleurotomella vaginata* Dall.  
 \* \* \* \* \*  
*Mangilia acrocarinata* Dall.  
 \* \* \* \* \*  
*Philbertia perdecorata* Dall.  
*Philbertia perdecorata*, var. *lionsa* Dall.  
*Philbertia extenuata* Dall.

- Clathrodrillia inimica* Dall.  
*Clathrodrillia orellana* Dall.  
*Clathrodrillia dolana* Dall.  
*Clathrodrillia fanoa* Dall.  
*Clathrodrillia acrybia* Dall.  
*Suavodrillia? textilia* Dall.  
*Daphnella sagena* Dall.  
*Daphnella epomis* Dall.  
*Mangilia dalli* Verrill.  
*Mangilia chasmata* Dall.  
*Mangilia lastica* Dall.  
*Mangilia tachnodes* Dall.  
*Mangilia crossata* Dall.  
*Mangilia cryera* Dall.  
*Mangilia christina* Dall.  
*Mangilia fritillaria* Dall.  
*Mangilia subcircularis* Dall.  
*Mangilia percompacta* Dall.  
*Mangilia acloneta* Dall.  
*Mangilia acloneta*, var. *cestrota* Dall.  
*Mangilia cratera* Dall.  
*Mangilia areia* Dall.  
*Mangilia loraeformis* Dall.  
*Mangilia pelagia* Dall.  
*Mangilia rhabdea* Dall.  
*Cymatosyrinx ebur* Dall.  
*Admete microscopica* Dall.  
*Admete nodosa* Verrill and Smith.  
*Olivella tubulata* Dall.  
*Olivella bullula* Reeve.  
*Marginella fernandinae* Dall.  
*Marginella canilla* Dall.  
*Marginella ocella* Dall.  
*Marginella tanora* Dall.  
*Marginella incesa* Dall.  
*Marginella inepta* Dall.  
*Marginella imitator* Dall.  
*Marginella microgonia* Dall.  
*Marginella esther* Dall.  
*Hyalina styria* Dall.  
*Hyalina styria minor* Dall.  
*Hyalina elusiva* Dall.  
*Hyalina avenella* Dall.  
*Cypraeolina hadria* Dall.  
*Cypraeolina tinolia* Dall.  
*Cypraeolina truncata* Dall.  
*Aurinia gouldiana* Dall.  
*Mitra styliola* Dall.  
*Mitra zilpha* Dall.  
*Mitra hendersoni* Dall.  
*Mitra grammatula* Dall.  
*Mitra wandoensis* Holmes.  
*Mitromorpha biplicata* Dall.  
*Mitromorpha undulata* Dall.  
*Fasciolaria*, species.  
*Fusinus schrammi* Crosse.  
*Fusinus bullatus* Dall.  
*Fusinus vitreus* Dall.  
*Siphonorbis perminutus* Dall.  
*Astyris pura* Verrill.  
*Astyris perlucida* Dall.  
*Astyris stemma* Dall.  
*Astyris (Fluella) vidua* Dall.  
*Astyris (Fluella) amphissella* Dall.  
*Astyris (Fluella) rushii* Dall.  
*Astyris (Fluella) enida* Dall.  
*Astyris (Fluella) appressa* Dall.  
*Astyris (Plectaria) crumena* Dall.  
*Astyris (Plectaria) embusa* Dall.  
*Astyris (Plectaria) euribia* Dall.  
*Astyris (Plectaria) projecta* Dall.  
*Astyris (Plectaria) albella* C. B. Adams.  
*Astyris (Plectaria)*, species.  
*Astyris (Parasagena) georgiana* Dall.  
*Astyris (Parasagena) sagenata* Dall.  
*Columbella (Atilia?) mystica* Dall.  
*Pteropurpura tristicha* Dall.  
*?Urosalpinx verrillii* Dall.  
*?Urosalpinx stimpsoni* Dall.  
*Coralliophila lactuca* Dall.  
*Epitonium marcoense* Dall.  
*Epitonium fractum* Dall.  
*Epitonium azelotes* Dall.  
*Epitonium opalinum* Dall.  
*Epitonium lavaratum* Dall.  
*Epitonium discobolaria* Dall.  
*Epitonium caninum* Dall.  
*Epitonium*, species.  
*Opalia*, species.  
*Opalia? dromio* Dall.  
*Melanella callistemma* Dall.  
*Melanella oleacea* Kurtz and Stimpson.  
*Melanella conoidea* Kurtz and Stimpson.  
*Melanella penna* Dall.  
*Melanella rectiuscula* Dall.  
*Melanella fernandinae* Dall.  
*Melanella cinca* Dall.  
*Melanella abida* Dall.  
*Melanella corrada* Dall.  
*Melanella arcuata* C. B. Adams.  
*Melanella ophiodon* Dall.  
*Melanella anachorea* Dall.  
*Melanella stamina* Dall.  
*Melanella patula* Dall and Simpson.  
*Melanella versa* Dall.  
*Melanella ira* Dall.  
*Melanella parallela* Dall.  
*Strombiformis elata* Dall.

- Strombiformis fusus* Dall.  
*Niso microforis* Dall.  
*Aclis georgiana* Dall.  
*Aclis dalli* Bartsch.  
*Aclis limata* Dall.  
*Aclis stilifer* Dall.  
*Aclis fernandinae* Dall.  
*Aclis pendata* Dall.  
*Aclis conula* Dall.  
*Aclis lata* Dall.  
*Aclis pyramida* Dall.  
*Aclis tenuis* Verrill.  
*Aclis cubana* Bartsch.  
*Aclis rhyssa* Dall.  
*Aclis hendersoni* Dall.  
*Aclis (Amblyspira) immaculata* Dall.  
*Mucronalia mammillata* Dall.  
*Mucronalia suava* Dall.  
*Mucronalia? bulimuloides* Dall.  
*Stilifer verrilli* Dall.  
*Stilifer minima* Dall.  
*Stilifer minuta* Dall.  
*Pyramidella (Longchaeus), species.*  
*Pyramidella (Sulcorinella) camara* Bartsch.  
*Pyramidella (Syrnola) fernandina* Bartsch.  
*Pyramidella (Syrnola) floridana* Bartsch.  
*Pyramidella (Syrnola) georgiana* Bartsch.  
*Turbonilla (Ptycheulimella) hespera* Bartsch.  
*Turbonilla (Ptycheulimella) melea* Bartsch.  
*Turbonilla (Strioturbonilla) nemea* Bartsch.  
*Turbonilla (Strioturbonilla) pyrrha* Bartsch.  
*Turbonilla (Strioturbonilla) theona* Bartsch.  
*Turbonilla (Strioturbonilla) electra* Bartsch.  
*Turbonilla (Strioturbonilla) rhea* Bartsch.  
*Turbonilla (Strioturbonilla) sirena* Bartsch.  
*Turbonilla (Strioturbonilla) leta* Bartsch.  
*Turbonilla (Strioturbonilla) myia* Bartsch.  
*Turbonilla (Strioturbonilla) enn* Bartsch.  
*Turbonilla (Strioturbonilla) idothea* Bartsch.
- Turbonilla (Strioturbonilla) nonica* Bartsch.  
*Turbonilla (Pyrgiscus) conoma* Bartsch.  
*Turbonilla (Pyrgiscus) miona* Bartsch.  
*Turbonilla (Mormula) anira* Bartsch.  
*Odostomia (Evalea) fernandina* Bartsch.  
*Odostomia (Evalea) ryckea* Bartsch.  
*Odostomia (Evalea) ryalea* Bartsch.  
*Pedicularia decussata* Gould.  
*Sequenzia florida* Dall.  
*Sequenzia rushi* Dall.  
*Alabina cerithidioides* Dall.  
*Mathilda georgiana* Dall.  
*Mathilda yucatecana* Dall.  
*Mathilda lacteosa* Dall.  
*Mathilda globulifera* Dall.  
*Mathilda granifera* Dall.  
*Mathilda amaea* Dall.  
*Mathilda rushii* Dall.  
*Mathilda hendersoni* Dall.  
*Tuba jeffreysi* Dall.  
*Turritellopsis floridana* Dall.  
*Triphora (Biforina) carraca* Dall.  
*Triphora (Biforina) georgiana* Dall.  
*Triphora (Biforina) indigena* Dall.  
*Triphora (Biforina) aspera* Jeffreys.  
*Triphora (Strobiligera) pompona* Dall.  
*Triphora (Strobiligera) gaesona* Dall.  
*Triphora (Strobiligera) enopla* Dall.  
*Triphora (Strobiligera) meteora* Dall.  
*Triphora (Strobiligera) compsa* Dall.  
*Triphora (Strobiligera) sentoma* Dall.  
*Cerithiopsis georgiana* Dall.  
*Laskeya (Onchodia) benihica* Dall.  
*Laskeya (Onchodia) merida* Dall.  
*Laskeya (Onchodia) serina* Dall.  
*Laskeya (Onchodia) docata* Dall.  
*Laskeya (Onchodia) argentea* Dall.  
*Laskeya (Onchodia) decora* Dall.  
*Laskeya (Onchodia) althea* Dall.  
*Laskeya (Onchodia) elima* Dall.  
*Laskeya (Onchodia) elsa* Dall.  
*Laskeya (Onchodia) apicina* Dall.  
*Laskeya (Onchodia) honora* Dall.  
*Laskeya (Onchodia) eliza* Dall.  
*Laskeya (Onchodia) petala* Dall.  
*Laskeya (Onchodia) leipha* Dall.  
*Stilus vitreus* Dall.  
*Cerithiella producta* Dall.  
*Seila subalbida* Dall.  
*Trichotropis (Iphinopsis) nuda* Dall.  
*Trichotropis (Iphinopsis) turrita* Dall.  
*Rissoina mayori* Dall.



- Rissoa pompholyx* Dall.  
*Rissoa (Nodulus) fernandinae* Dall.  
*Rissoa (Cingulina) curta* Dall.  
*Capulus intortus* Lamarek.  
*Polinices (Euspira) bahamensis* Dall.  
*Leptothyra induta* Watson.  
*Solariella cancella* Dall.  
*Solariella aegleis* Watson.  
*Solariella crossata* Dall.  
*Euchelus eucasta* Dall.  
*Basilissa (Ancistrobasis) costulata* Watson.  
*Basilissa watsoni* Dall.  
*Vitrinella georgiana* Dall.  
*Cocculina lissocona* Dall.  
*Diadora bermudensis* Dall and Bartsch.
- Puncturella profundi* Jeffreys.  
*Puncturella profundi multifila* Dall.  
*Puncturella oxia* Watson.  
*Puncturella hendersoni* Dall.  
*Puncturella circularis* Dall.  
*Puncturella tenuicula* Dall.  
*Puncturella (Cranopsis) asturiana* Fischer.  
*Fissurisepta triangulata* Dall.  
*Emarginula (Rimula) larva* Dall.  
*Emarginula cancellata* Philippi.  
*Emarginula compressa* Cantraine.  
*Scissurella crispata* Fleming.  
*Scissurella proxima* Dall.  
*Bathysciadium? concentricum* Dall.  
*Ischnochiton striolatus* Gray.

## BRACHIOPODA

### Family TEREBRATULIDAE

#### Genus TEREBRATULINA Orbigny

##### TEREBRATULINA CAILLETI Crosse

- Terebratulina cailleti* CROSSE, Journ. de Conchyl., vol. 13, p. 27, figs. 1, 2, 3, 1865.—DALL, Bull. Mus. Comp. Zoöl., vol. 3, No. 1, p. 10, 1871.—DAVIDSON, Mon. Rec. Brach., pt. 1, p. 26, pl. 5, figs. 41, 42, 1886.—DALL, Annot. List Rec. Brach. Nat. Mus., p. 308, 1920.

Off Georgia and Fernandina to Barbados, in 18 to 450 fathoms, the tropical specimens in the shallower water.

#### Genus GRYPHUS Megerle

##### GRYPHUS CUBENSIS Poutalés

- Terebratula cubensis* POURTALÉS, Bull. Mus. Comp. Zoöl., vol. 1, No. 6, p. 109, Dec. 1867.—DALL, Bull. Mus. Comp. Zoöl., vol. 3, p. 3, pl. 1, figs. 2, 8-15, 1871.—DAVIDSON, Challenger Brach., p. 28, pl. 2, figs. 10, 11, 1880.

*Gryphus cubensis* DALL, Annot. List Rec. Brach. Nat. Mus., p. 315, 1920.

Off Fernandina and to the Gulf of Mexico and south to the Lesser Antilles in 75 to 400 fathoms, living.

##### GRYPHUS AFFINIS Calcara

- Terebratula affinis* CALCARA, Cenzo Moll. viv. e foss. di Sicilia, p. 48, 1845.  
*Gryphus affinis* DALL, Annot. List Brach., Proc. U. S. Nat. Mus. No. 2314, p. 312, 1920.

Off Georgia and Fernandina, four valves tentatively referred to this species, which was described from the Mediterranean.

## Family TEREBRATULIDAE

## Genus DALLINA Beecher

## DALLINA FLORIDANA Pourtalés

*Waldheimia floridana* POURTALÉS, Bull. Mus. Comp. Zool., vol. 1, p. 127, 1868.—DALL, Bull. Mus. Comp. Zool., vol. 3, p. 12, pl. 1, fig. 3; pl. 2, figs. 1, 2, 3, 1871.—DAVIDSON, Mon. Rec. Brach., pt. 2, p. 59, pl. 12, figs. 1-5, 1887.

*Dallina floridana* BEECHER, Trans. Conn. Acad. Sci., vol. 9, p. 382, pl. 1, fig. 45, 1893.—DALL, Annot. List Rec. Brach. Nat. Mus., p. 358, 1920.

Off Fernandina and in the Gulf of Mexico and southward to Porto Rico, in 90 to 270 fathoms.

## Family DISCINIDAE

## Genus PELAGODISCUS Dall

## PELAGODISCUS ATLANTICUS King

*Discina atlantica* KING, Proc. Nat. Hist., Soc. Dublin, vol. 5, pp. 170-173, 1868.—JEFFREYS, Ann. Mag. Nat. Hist., ser. 4, vol. 18, p. 252, 1856.—DAVIDSON, Challenger Brach, p. 62, pl. 4, figs. 17-18, 1880.

*Disciniscia atlantica* DALL, Proc. Acad. Nat. Sci. Phila. for 1873, p. 201.—DAVIDSON, Mon. Rec. Brach., pt. 3, p. 200, pl. 26, figs. 18-22, 1888.

*Pelagodiscus atlanticus* DALL, Bull. Mus. Comp. Zool., vol. 43, pt. 6, p. 440, 1908; Annot. List Rec. Brach. Nat. Mus., p. 280, 1920.

Off Fernandina and in both Atlantic and Pacific Oceans in depths down to 2,995 fathoms.

## MOLLUSCA

## PELECYPODA

## Family NUCULIDAE

## Genus NUCULA Lamarck

## NUCULA CULEBRENSIS E. A. Smith

*Nucula culebrensis* E. A. SMITH, Challenger Pelecypoda, p. 228, pl. 18, figs. 11, 11a., 1885.

Off Georgia and Fernandina, rather common; off Culebra Island in 390 fathoms at station 24 of the *Challenger* expedition.

The teeth average 7 and 14 on the two sides of the beak; the young shells hardly indicate the minute crenulations of the margin which are developed in the adults. *Nucula crenulata* A. Adams, from Guadeloupe may be identical with this species but in the absence of authentic specimens of *crenulata* it seems safer to adopt Smith's name about the application, of which there is no doubt. The margin of the escutcheon is usually crenulate.

## NUCULA FERNANDINAE, new species

Shell resembling *N. culebrensis* in sculpture but less emphatic, the form much more trigonal and relatively more inflated, the marginal crenulations coarser, the escutcheon feebly impressed with no distinct limits and no bordering crenulation. Length, 4; height, 3.6; diameter, 2.25 mm. U. S. Nat. Mus. Cat. No. 108198.

Off Fernandina, two specimens and one larger valve. The teeth numbered 8 and 11; the beaks are particularly prominent. From the variety *obliterata* of *N. crenulata* it differs by form, by greater solidity, and apparently by smaller size. Both forms are distinctly more trigonal than *N. crenulata* A. Adams, but the present one especially so.

## NUCULA VERRILLI Dall

*Nucula trigona* VERRILL, Trans. Conn. Acad., vol. 6, p. 438, 1885; not of Bronn, 1849.

*Nucula verrillii* DALL, Bull. Mus. Comp. Zool., vol. 12, p. 248, 1886; Proc. U. S. Nat. Mus., vol. 12, p. 257, pl. 14, fig. 4, 1889.—VERRILL and BUSH, Proc. U. S. Nat. Mus., vol. 20, p. 853, pl. 95, fig. 10, 1898.

Off Fernandina and Georgia, north to latitude 39° 44' and south to Yucatan, in 294 to 1,825 fathoms.

This occurs in moderate numbers.

## NUCULA PROXIMA OVATA Verrill

*Nucula proxima* (Say), variety *ovata* VERRILL, Proc. U. S. Nat. Mus., vol. 20, No. 1139, p. 852, pl. 81, fig. 6, pl. 88, fig. 5, 1898.

Off Georgia, and in Vineyard Sound off Cuttyhunk, in 18 fathoms (Verrill).

One valve apparently referable to this form was dredged off Georgia.

## Family LEDIDAE

## Genus LEDA Schumacher

## Section LEDELLA Verrill

## LEDA MESSANENSIS Seguenza

*Leda acuminata* JEFFREYS, Ann. Mag. Nat. Hist., July, 1870, p. 69.—SEGUEENZA, Nuc. Terz., p. 1175 pl. 3, figs. 15 a—15 e.: not of von Buch, 1849.

*Leda messanensis* SEGUENZA, Nuc. Terz., p. 1175.—JEFFREYS, Proc. Zool. Soc., June 17, 1879, p. 576, 1880.

Off Georgia and Fernandina, not uncommon. South to Barbados in depth from 100 to 1,002 fathoms.

## LEDA ORIXA, new species

Shell small, smooth, equivalve, nearly equilateral, rounded in front, acute behind, with a slight flexure in front of the rostrate end, the

beaks inconspicuous, slightly nearer the posterior end, the surface dull, rarely with a few concentric markings; the resilifer minute, the hinge with 14 anterior and about 7 posterior teeth. Length, 4; height, 2.25; diameter, 1.5 mm. U. S. Nat. Mus. Cat. No. 108190.

Off Fernandina, rather common.

The shell is close to *L. hebes* E. A. Smith, from near Culebra Island, which has the posterior end longer than the anterior and wants the flexure in front of the rostrum.

#### LEDA ASPECTA, new name

*Ledella parva* VERRILL and BUSH, Amer. Journ. Sci., vol. 3, p. 54, fig. 18, Jan., 1897; Proc. U. S. Nat. Mus., vol. 20, No. 1139, p. 857, pl. 81, fig. 1, 1898.

Off Georgia and Fernandina, numerous specimens. Off Marthas Vineyard in 525 fathoms, Verrill.

There is no defined escutcheon. Not. *L. parva* Sowerby, 1833.

#### LEDA BIPENNIS, new species

Shell small, smooth, not flexed behind, the beaks inconspicuous, the anterior end rounded, the basal margin nearly straight, the posterior slope longer, descending to a subtruncate end of the shell; resilifer minute, not projecting, teeth about 10 on each side of it; there is no indication of an escutcheon. Length, 4.5; height, 3; diameter, 2.1 mm. U. S. Nat. Mus. Cat. No. 108187.

Off Fernandina, rare.

#### Genus YOLDIELLA Verrill and Bush

##### YOLDIELLA PYGMAEA Münster

*Nucula pygmaea* MÜNSTER in Goldfuss, Petr. Germ., vol. 2, p. 157, pl. 125, fig. 17, 1842.

*Leda pygmaea* ORBIGNY, Prodr. Pal., vol. 2, p. 378, 1852.

*Leda (Portlandia) pygmaea* HANLEY, Mon. Nuculidae (in Sowerby, Thes. Conch.), p. 41, pl. 2, figs. 26, 27, 1860.

Off Fernandina, rather common.

There seems to be some difference of opinion as to whether the recent shell is identical with Münster's fossil form, but at any rate the present species has been identified with the latter by Hanley, Jeffreys, and Marshall, as indicated by specimens received from them.

##### YOLDIELLA FRATERNA Verrill and Bush

*Yoldiella fraterna* VERRILL and BUSH, Proc. U. S. Nat. Mus., vol. 20, No. 1139, p. 867, pl. 80, fig. 5; pl. 82, fig. 8, 1898.

Off Georgia, seven specimens. Off the Atlantic coast from latitude 37° to latitude 47° in 90 to 1,608 fathoms; Verrill.

## Subfamily MALLETIINAE

## Genus MALLEZIA Desmoulins

## Section NEILO Adams

## MALLEZIA DILATATA Philippi

*Nucula dilatata* PHILIPPI, Moll. Sicil., vol. 2, p. 47, pl. 15, fig. 7, 1844.

*Neilo dilatata* SEGUENZA, Nucul. Terz., p. 1184, 1877.

*Malletia* (*Neilo* ?) *dilatata* DALL, Bull. Mus. Comp. Zool., vol. 9, No. 2, p. 255, 1881.

Off Fernandina, two valves. Off Morro Light, Havana, in 292 fathoms, U. S. S. *Blake*.

## Genus TINDARIA Bellardi

## TINDARIA CYTHEREA Dall

*Nucula* (*Tindaria* ?) *cytherea* DALL, Bull. Mus. Comp. Zool., vol. 9, p. 123, 1881; vol. 12, No. 6, p. 254.

*Malletia veneriformis* E. A. SMITH, Challenger Pelecypoda, p. 246, pl. 20, figs. 9, 9a, 1885.

Off Fernandina, not rare. Gulf of Mexico and eastward to St. Vincent, United States Fish Commission.

## TINDARIA ACINULA Dall

*Malletia* (*Tindaria*) *acinula* DALL, Proc. U. S. Nat. Mus., vol. 12, No. 773, p. 253, pl. 13, fig. 4, 1889.

*Tindariopsis* (? *Neilonella*) *acinula* DALL, Trans. Wagner Inst., vol. 3, pt. 4, p. 582.—VERRILL and BUSH, Proc. U. S. Nat. Mus., vol. 20, No. 1139, p. 881, 1898.

Shell small, smooth except for incremental lines, whitish, inflated, the anterior end shorter, evenly rounded; posterior end longer, pointed, the dorsal slope sharp, the base arcuate; erect; ligament dividing the hinge line, teeth about 10 on each side; pallial line with a slight indentation near the posterior scar. Length, 5.0; height, 3.5; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 108195.

Off Fernandina, a dozen valves. East of Tobago in 880 fathoms; south of St. Kitts, 687 fathoms; and 98 miles north of Ceara, Brazil, in 1,019 fathoms; U. S. S. *Albatross*.

## Genus PSEUDOGLOMUS Dall

## PSEUDOGLOMUS POMPHOLYX Dall

*Yoldia pompholyx* DALL, Proc. U. S. Nat. Mus., vol. 12, No. 773, p. 255, pl. 13, fig. 8, 1889.

*Tindaria* (*Pseudoglomus*) *pompholyx* DALL, Trans. Wagner Inst., vol. 3, pt. 4, p. 582, 1898.

Off Fernandina, nine valves.

Externally like *Pristigloma*, but without the internal resilium of that genus; with a central external short ligament and more substantial hinge teeth, about seven anterior and nine posterior in the adult.

## Genus PRISTIGLOMA Dall, 1900

## PRISTIGLOMA NITENS Jeffreys

*Glomus nitens* JEFFREYS, Ann. Mag. Nat. Hist., Nov. 1876, p. 433.—VERBILL and BUSH, Amer. Journ. Sci., vol. 3, pp. 53, 59, Jan. 1897; Proc. U. S. Nat. Mus., vol. 20, No. 1139, p. 848, pl. 97, figs. 1, 2, 1898. (Not *Glomus* Gistel, 1848.)

Off Fernandina, one valve. From off Martha's Vineyard south to Rio de la Plata in 1,504 to 1,900 fathoms, U. S. S. *Albatross*.

This curious form seems intermediate between forms like *Pseudoglomus* and *Limopsis*. The minute wrinkles indicated as "lateral teeth" do not occur on other specimens than Verrill's type and are possibly an individual development. At any rate they are barely perceptible under the microscope and may be pathological.

## Family ARCIDAE

## Genus LIMOPSIS

## LIMOPSIS TENELLA Jeffreys

*Limopsis tcnella* JEFFREYS, Ann. Mag. Nat. Hist., Nov. 1876, p. 433.—DALL Bull. Mus. Comp. Zool., vol. 9, p. 118, 1881; vol. 12, No. 6, p. 236, 1886.

Off Fernandina, a few young specimens.

This species was dredged in immense numbers off the Florida coast and among the Antilles by Mr. J. B. Henderson; and by the *Albatross* as far south as Puerto Gallegos in southern Argentina, latitude 51° south, and in depths from 50 to 700 fathoms.

## LIMOPSIS MINUTA Philippi

*Pectunculus minutus* PHILIPPI, Moll. Sicil., vol. 1, p. 63, pl. 5, fig. 3, 1836; vol. 2, p. 45, 1844.

*Limopsis borealis* WOODWARD, teste Jeffreys.

*Limopsis minuta* DALL, Bull. Mus. Comp. Zool., vol. 9, No. 2, p. 119, 1881; vol. 12, No. 6, p. 236, 1886.—VERBILL, Proc. U. S. Nat. Mus., vol. 20, No. 1139, p. 846, pl. 75, fig. 1; pl. 78, fig. 7, 1898.

Off Georgia and Fernandina. South to the lesser Antilles in 30 to 2,221 fathoms.

## LIMOPSIS RADIALIS, new species

Shell minute, white, subovate, moderately convex, with the inner margins minutely crenate; beaks small, prominent; hinge line short, teeth on each side few, small, somewhat radially arranged; sculpture of low small regular concentric rounded ridges crossed by about a dozen widely spaced rather prominent radial threads. Length, 3.7; height, 3.8; diameter, 2; hinge line, 2 mm. U. S. Nat. Mus. Cat. No. 108184.

Off Fernandina, four valves.

The sculpture is somewhat like that of *L. antillensis* Dall, but the form and hinge quite different.

## LIMOPSIS ONCHODES, new species

Shell small, narrow, oblique, inflated, the beaks prominent, the inner margins crenulate; area rather large; hinge line short, with four oblique teeth on the shorter side and eight more vertical on the other; sculpture of numerous fine equal radiating threads with equal or narrower interspaces; concentric sculpture only of faint incremental lines. Length, 5.0; height, 5.5; diameter, 4; hinge line, 3.5 mm. U. S. Nat. Mus. Cat. No. 108183.

Off Fernandina, two valves.

I have been unable to find any recent species closely resembling this.

## Genus CUCULLARIA Conrad

## CUCULLARIA SAGRINATA Dall

*Macrodon sagrinata* DALL, Bull. Mus. Comp. Zool., vol. 12, No. 6, p. 245, September, 1886.

*Arca (Cucullaria) sagrinata* DALL, Trans. Wagner Inst., vol. 3, pt. 4, p. 659, 1898; Proc. U. S. Nat. Mus., vol. 24, No. 1264, p. 508, pl. 31, fig. 2, March, 1902.

Off Fernandina and Georgia; numerous valves. Gulf of Mexico, in 80 fathoms, U. S. S. *Albatross*.

## Genus ARCA Linnaeus

## Subgenus BARBATIA (Gray) Adams

## BARBATIA, sp. indet.

Off Fernandina, three very young valves.

These, though undoubtedly belonging to *Barbatia*, are too young to determine the species.

## Subgenus BATHYARCA Kobelt

## BATHYARCA ORBICULATA Dall

*Bathyarca pectunculoides*, var. *orbiculata* DALL, Bull. Mus. Comp. Zool., vol. 9, p. 121; vol. 12, No. 6, p. 240, pl. 8, fig. 5, 1886.

Off Georgia and Fernandina. Gulf of Mexico, at Blake Station 33, in 1,568 fathoms.

## BATHYARCA INAEQUALIS, new species

Shell minute, white, translucent, very inequilateral, the anterior end short, attenuated, rounded, the posterior longer, widely expanded, rounded; beaks prominent, small; area nearly linear, hinge line with three very oblique teeth at each end separated by a long edentulous space; inner margins smooth; sculpture very faintly cancellate by incremental and radial striae, more evident toward the ends and basal

edges of the valve. Length, 3.5; greatest vertical measure, 2.75; diameter, 2.2 mm. U. S. Nat. Mus. Cat. No. 108179.

Off Fernandina, one value.

This is nearest to *B. frielei* Jeffreys, but is smaller and relatively longer. Its form recalls *Dacrydium vitreum*.

## Family PECTINIDAE

### Genus PECTEN Müller

#### Subgenus PSEUDAMUSIUM Adams

##### PSEUDAMUSIUM NANUM Verrill and Bush

*Cyclopecten nanus* VERRILL and BUSH, Trans. Conn. Acad., vol. 10, pp. 85, '92, pl. 16, figs. 12, 12 c., 1897; Proc. U. S. Nat. Mus., vol. 20, No. 1139, p. 837, pl. 85, figs. 2-4, 1898.

Off Fernandina, three valves. Atlantic coast to North latitude 37° in 43 to 132 fathoms, United States Fish Commission.

#### Subgenus PROPEAMUSIUM Gregorio

##### PROPEAMUSIUM POURTALESIANUM Dall

*Amusium (Propeamusium) pourtalesianum* DALL, Bull. Mus. Comp. Zool., vol. 12, No. 6, p. 211, pl. 4, fig. 3; pl. 5, fig. 12, 1886.

From off Fernandina and the Gulf of Mexico south to the lesser Antilles, in depths living, from 13 to 805 fathoms, and temperatures from 39.5° to 82.5° F.

## Family LIMIDAE

### Subgenus LIMATULA S. Wood

##### LIMATULA LAMINIFERA E. A. Smith

*Lima (Limatula) laminifera* E. A. SMITH, Challenger rept. Pelecypoda, p. 293, pl. 24, figs. 7, 7 a., 1885.

Off Fernandina, one valve. Off Sombrero, in 450 and off Culebra in 390 fathoms, Challenger expedition.

### Genus LIMAEA Bronn

##### LIMAEA BRONNIANA Dall

*Limaea bronniana* DALL, Bull. Mus. Comp. Zool., vol. 12, No. 6, p. 226, 1886; Proc. U. S. Nat. Mus., vol. 12, p. 251, pl. 14, fig. 9, 1889.

Off Fernandina, one valve. North Carolina to Barbados in 15 to 804 fathoms; United States Fish Commission.



## Family POROMYACIDAE

## Genus POROMYA Forbes

## POROMYA GRANULATA Nyst and Westendorp

*Corbula? granulata* NYST and WESTENDORP, Nouv. Recherch. Coq. Foss. d'Anvers, p. 6, pl. 3, fig. 3, 1839.

*Poromya anatinoides* FORBES, Rep. Brit. Assoc., 1843, p. 191.

*Poromya granulata* FORBES and HANLEY, Brit. Moll., vol. 1, p. 204, pl. 9, figs. 4, 5, 6, 1853.

Off Fernandina, three valves. Florida Keys and the Antillean region in 15 to 227 fathoms, in temperatures 46° to 60° F.

## Family VERTICORDIIDAE

## Genus LYONSIELLA M. Sars

## LYONSIELLA ABYSSICOLA Sars

*Lyonsiella abyssicola* M. Sars, Rem. forms Anim. life, p. 25, pl. 3, figs. 21-43, 1872.

Off Fernandina, three valves. Widely distributed in the deep water of the North Atlantic.

## Genus VERTICORDIA Wood

*Verticordia* WOOD, in Sowerby, Min. Conch., pl. 639, August, 1844.

## Section VERTICORDIA s. s.

## VERTICORDIA SEGUENZAE Dall

*Verticordia seguenzae* DALL, Bull. Mus. Comp. Zool., vol. 12, No. 6, p. 290, 1886.

Off Fernandina and Georgia, rather rare. North Carolina to Yucatan straight in 124 to 640 fathoms, United States Fish Commission.

## Section TRIGONULINA Orbigny

## VERTICORDIA ORNATA Orbigny

*Trigonulina ornata* ORBIGNY, Moll. Cuba, vol. 2, p. 292, pl. 27, figs 30-33, 1846.

*Verticordia ornata* DALL, Bull. Mus. Comp. Zool., vol. 9, p. 105, 1881.

*Verticordia caelata* VERRILL, Trans. Conn. Acad., vol. 5, p. 566, 1884; vol. 6, pl. 30, fig. 9.

Off Fernandina and Georgia. Martha's Vineyard to Barbados; California; Japan and China Seas; United States Fish Commission.

## Family LEPTONIDAE

## Genus MONTACUTA Turton

## MONTACUTA LIMPIDA Dall

*Montacuta limpida* DALL, Proc. U. S. Nat. Mus., vol. 21, p. 894, pl. 87, figs. 5, 11, 1899.

One valve off Fernandina; one off Cape Florida in the Gulf of Mexico, in 85 fathoms.

**Genus ERYCINA Lamarck**

**ERYCINA FERNANDINA Dall**

*Erycina fernandina* DALL, Proc. U. S. Nat. Mus., vol. 21, p. 887, pl. 88, fig. 6, 1889.

Off Fernandina, one specimen.

**Family THYASIRIDAE**

**Genus THYASIRA (Leach) Lamarck**

**Section AXINULUS Verrill and Bush**

**THYASIRA SUCCISA Jeffreys**

*Thyasira succisa* JEFFREYS, Ann. Mag. Nat. Hist., vol. 19, Dec. 1876, p. 492  
Off Fernandina, two valves.

**Family KELLIELLIDAE**

**Genus KELLIELLA Sars**

**KELLIELLA NITIDA Verrill**

*Kelliella nitida* VERRILL, Trans. Conn. Acad., vol. 6, p. 438, 1885; Proc. U. S. Nat. Mus., vol. 20, No. 1139, p. 778, pl. 91, fig. 8; pl. 93, fig. 10, 1898.

Off Fernandina, eight valves. From north latitude 39° 5' south to latitude 38° 20' in 1,525 to 2,033 fathoms; United States Fish Commission.

**Family CUSPIDARIIDAE**

**Genus CUSPIDARIA Nardo**

**CUSPIDARIA ARCTICA Sars**

*Neaera arctica* G. O. SARS, Moll. Reg. Arct. Norv., p. 85, pl. 6, figs. 5 a-5 c, 1878.

Off Fernandina, one valve. North Atlantic, Sars and Verrill.

**CUSPIDARIA, sp. indet**

A single right valve resembling *C. gracilis* in form but more polished and with half a dozen fine radial threads on the rostrum; the resilifer is prominent and directed forward, the hinge is edentulous. In the absence of the other valve it seems best to leave it unnamed. Length, 11; height, 7; diameter, 4.3 mm. U. S. Nat. Mus. Cat. No. 108209.

Off Fernandina, one right valve. In the extensive collection of the genus in the National collection I was unable to match this valve.

**Genus HALONYMPHA DALL AND SMITH**

**HALONYMPHA CLAVICULATA Dall**

*Neaera claviculata* DALL, Bull. Mus. Comp. Zool., vol. 9, p. 112, 1881.—SMITH, Challenger Pelecy-poda, p. 52 (not pl. 9, figs. 8, 8 b.) 1885.

*Halongympha claviculata* DALL, Bull. Mus. Comp. Zoöl., vol. 12, No. 6, p. 301, pl. 2, figs. 2, 2 a., 1886.

Off Fernandina, two valves. Also near Bermuda in 435 fathoms, and off Havana in 450 fathoms.

### Family ASTARTIDAE

#### Genus ASTARTE J. Sowerby

##### ASTARTE GLOBULA Dall

*Astarte smithi*, var. *globula* DALL, Bull. Mus. Comp. Zoöl., vol. 12, No. 6, p. 260, 1886.

*Astarte globula* DALL, Proc. U. S. Nat. Mus., vol. 24, No. 1264, p. 508, pl. 32, fig. 6, March, 1902.

Off Fernandina, numerous specimens. At various localities in the Antilles; United States Fish Commission.

### Family MESODESMATIDAE

#### Genus ERVILIA Turton

##### ERVILIA CONCENTRICA Gould

*Ervilia concentrica* GOULD, Proc. Boston Soc. Nat. Hist., vol. 8, p. 281, Feb., 1862; Otia Conch., p. 239, 1862.

Off Georgia. Off the coast of North Carolina; Gould.

### Family PHOLADIDAE

#### Genus DIPLOTHYRA Tryon

##### DIPLOTHYRA SMITHII Tryon

*Diplothyra smithii* TRYON, Proc. Acad. Nat. Sci. Phila., 1862, p. 450, text figure, September, 1862.

Off Fernandina, one valve; Staten Island, Tryon.

## SCAPHOPODA

### Family DENTALIIDAE

#### Genus DENTALIUM

##### Section ANTALIS H. and A. Adams

##### DENTALIUM CERATUM Dall

*Dentalium ceratum* DALL, Bull. Mus. Comp. Zoöl., vol. 9, p. 38, 1881; vol. 18, p. 424, pl. 26, fig. 5; pl. 27, fig. 2, 1889.—HENDERSON, Bull. U. S. Nat. Mus. No. 111, p. 50, pl. 7, figs. 2, 4, 5, 6, 7, 1920.

Off Fernandina. Also from the Florida Keys to Barbados in 60 to 805 fathoms, temperatures 39.75° to 46.75° F.

**DENTALIUM TUBULATUM** Henderson

*Dentalium tubulatum* HENDERSON, Bull. U. S. Nat. Mus. 111, p. 53, pl. 8, fig. 5, 1920.

Off Fernandina. Also off Bahia Honda, Cuba, in 220 fathoms, temperature 62° F., U. S. S. *Blake*.

**Section BATHOXIPHUS** Pilsbry and Sharp**DENTALIUM ENSICULUS** Jeffreys

*Dentalium ensiculus* JEFFREYS Ann. Mag. Nat. Hist., ser. 4, vol. 19, p. 154, 1877; Proc. Zool. Soc., 1882, p. 660, pl. 49, fig. 4.—HENDERSON, Bull. U. S. Nat. Mus. 111, p. 81, pl. 14, figs. 1, 4, 5, 7, 9, 1920.

*Dentalium sigsbeanum* DALL, Bull. Mus. Comp. Zool., vol. 9, p. 38, 1881.

Off Fernandina. Georges Bank to St. Bart's and the Yucatan Strait, United States Fish Commission and the U. S. S. *Blake*. Eastern Atlantic, Jeffreys. Found in 193 to 1,859 fathoms; temperature 37° to 51.6° F.

**Section COMPRESSIDENS** Pilsbry and Sharp**DENTALIUM PRESSUM** Pilsbry and Sharp

*Dentalium compressum* WATSON, Journ. Linn. Soc. London, vol. 14, p. 516, 1879 (not of Orbigny, 1850); Challenger Scaphopoda, p. 9, pl. 1, fig. 9, 1885.

*Dentalium (Compressidens) pressum* PILSBRY and SHARP, in Tryon, Man. Conch., vol. 17, p. 124, pl. 7, fig. 11; pl. 22, figs. 50-52, 1897.—HENDERSON, Bull. U. S. Nat. Mus. 111, p. 83, pl. 14, figs. 3, 6, 8, 1920.

Off Fernandina. Florida Keys, Gulf of Mexico and Cape San Antonio; off Culebra Island, *Challenger* expedition. In 100 to 339 fathoms, temperature 43.4° to 51.6° F.

**DENTALIUM OPHIODON** Dall

*Dentalium ophiodon* DALL, Bull. Mus. Comp. Zool., vol. 9, p. 38, 1881; vol. 18, p. 427, pl. 26, fig. 9, 1889.—HENDERSON, Bull. U. S. Nat. Mus. 111, p. 84, pl. 14, fig. 2, 1920.

Off Fernandina. Florida Keys to Barbados, in 70 to 287 fathoms.

**Genus SIPHONODENTALIUM** Sars**Section ENTALINA** Monterosato**SIPHONODENTALIUM PLATAMODES** Watson

*Siphodontalium platamodes* WATSON, Journ. Linn. Soc. London, vol. 14, p. 519, 1879; Challenger Scaphopoda, p. 13, pl. 2, fig. 4, 1885.

*Entalina platamodes* HENDERSON, Bull. U. S. Nat. Mus. 111, p. 87, pl. 15, figs. 1, 4, 5, 7, 1920.

Off Fernandina. Rebecca shoals in 430 fathoms, Rush.

**SIPHONODONTALIUM STRIATINUM** Henderson

*Siphonodentalium striatinum* HENDERSON, Bull. U. S. Nat. Mus. 111, p. 90, pl. 16, figs. 3, 8, 1920.

Off Fernandina.

**Genus CADULUS** Philippi**Section PLATYSCHIDES** Henderson**CADULUS PROVIDENSIS** Henderson

*Cadulus (Platyschides) providensis* HENDERSON, Bull. U. S. Nat. Mus. 111, p. 122, pl. 18, fig. 14, 1920.

Off Fernandina. Also off Old Providence Island in 380 fathoms, sand; temperature 45.75° F. United States Fish Commission.

**Section GADILA** Gray**CADULUS RASTRIDENS** Watson

*Cadulus rastridens* WATSON, Journ. Linn. Soc. London, vol. 14, p. 525, 1879; Challenger Scaphopoda, p. 19, pl. 3, fig. 3, 1885.—HENDERSON, Bull. U. S. Nat. Mus. 111, p. 132, pl. 19, fig. 1, 1920.

Off Georgia and Fernandina. Off Culebra Island, in 390 fathoms, Challenger expedition.

**CADULUS REGULARIS** Henderson

*Cadulus (Gadila) regularis* HENDERSON, Bull. U. S. Nat. Mus. 111, p. 137, pl. 19, fig. 14, 1920.

Off Georgia and Fernandina. Also off Cape Canaveral, Florida, in 504 fathoms, temperature 45.7° F.

**CADULUS ACUS** Dall

*Cadulus acus* DALL, Bull. Mus. Comp. Zoöl., vol. 18, p. 432, pl. 27, fig. 11, 1889.

*Cadulus (Gadila) acus* HENDERSON, Bull. U. S. Nat. Mus. 111, p. 140, pl. 20, figs. 11, 13, 1920.

Off Fernandina. Also Mayaguez Harbor, Porto Rico, in 25 fathoms, temperature 75.8° F. St. Thomas, 5 fathoms; Santo Domingo; and the coast of Guatemala and British Honduras.

**Section CADULUS** s. s.**CADULUS TRANSITORIUS** Henderson

*Cadulus transitorius* HENDERSON, Bull. U. S. Nat. Mus. 111, p. 143, pl. 19, fig. 6, 1920.

Off Fernandina. Also Gulf of Mexico and south to Old Providence Island, in 90 to 660 fathoms, temperature 45.7° and 46.3° F.

## CADULUS OBESUS Watson

*Cadulus obesus* WATSON, Journ. Linn. Soc. London, vol. 14, p. 527, 1879; Challenger Scaphopoda, p. 22, pl. 3, fig. 8, 1885.—HENDERSON, Bull. U.S. Nat. Mus. 111, p. 146, pl. 20, fig. 8, 1920.

Off Fernandina. Bahia Honda, Cuba, in 200 fathoms, United States Fish Commission. Off Culebra Island in 390 fathoms; Watson.

## CADULUS PLATENSIS Henderson

*Cadulus platensis* HENDERSON, Bull. U.S. Nat. Mus. 111, p. 147, pl. 20, fig. 14, 1920.

Off Georgia and Fernandina. Off Ceará, Brazil, in 1,019 fathoms, temperature 39.5° F., and off Rio de la Plata in 11½ fathoms, United States Fish Commission.

This is *C. tumidosus* Dall, 1889, not of Jeffreys, 1877.

## GASTROPODA

## TECTIBRANCHIATA

## Family ACTEONIDAE

## Genus ACTEON Montfort

## ACTEON DANAIDA Dall

*Actaeon danaida* DALL, Bull. Mus. Comp. Zoöl., vol. 9, p. 96, 1881; vol. 18, p. 42, pl. 17, fig. 12, 1889.

Off Fernandina. Also off the Tortugas in 339 fathoms, temperature 45° F.

## ACTEON INCISUS Dall

*Actaeon incisus* DALL, Bull. Mus. Comp. Zoöl., vol. 9, p. 95, 1881; vol. 18, p. 42, pl. 17, figs. 1, 1b., 1889.

Off Fernandina, 10 specimens. Yucatan Strait, 640 fathoms.

## ACTEON HEBES Verrill

*Actaeon hebes* VERRILL, Trans. Conn. Acad., vol. 6, p. 428, pl. 44, fig. 15, 1885.

Off Georgia, two young specimens. Off North Carolina in 2,574 fathoms, temperature 36.8° F.

## ACTEON SEMICINGULATA new species

Shell small, translucent white, with a blunt immersed apex and about four visible whorls; surface finely spirally striated on the anterior half of the last whorl; suture distinct, very slightly shouldered; whorls moderately rounded, the last twice as long as the spire; aperture sublunate, slightly produced in front; outer lip thin, sharp, moderately arcuate; pillar lip thin with a hardly perceptible fold; a

narrow channel behind it. Height, 3; maximum diameter, 1.5 mm. U. S. Nat. Mus. Cat. No. 107913.

Off Fernandina, five specimens.

ACTEON PARTICOLOR, new species

Shell small, short, rotund, smooth, white with three brownish spiral bands on the last whorl; apex blunt, nucleus completely immersed, visible whorls about four, moderately rounded, separated by a distinct suture; aperture sublunate, outer lip thin, sharp, arcuate, rounding evenly in front to the slightly thickened strongly twisted pillar behind which is a minute chink; the last whorl comprises most of the shell. Height of shell, 3.5; of last whorl, 2.8; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 108274.

Off Georgia, one specimen.

The brown bands are liable to fade in the cabinet, even if kept in the dark.

ACTEON JUVENIS, new species

Shell minute, white, with a bluntly immersed nucleus and four moderately convex whorls; suture channelled with the whorl in front of it minutely narrowly tabulate; sculpture of (on the last whorl about a dozen) spiral conspicuously punctuate uniform grooves, covering the whorl; base imperforate, pillar with a feeble obscure plait lagging behind the aperture; outer lip thin, aperture narrowly ovate. Height, 3; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 107915.

Off Fernandina, four specimens.

The sculpture resembles that of *A. hebes*, jr., but the shell is much more slender.

ACTEON LIOTRACOIDES, new species

Shell small, translucent white, slender, with a blunt apex and nearly six whorls; surface polished, smooth except for microscopically fine spiral striae over the whole surface, stronger on the base; suture appressed, distinct, sides flatly compressed, the last whorl longer than the spire; aperture narrow, about two-thirds the length of the last whorl; outer lip sharp, thin, slightly arcuate, rounding evenly into the short slightly thickened arcuate pillar which carries an obscure fold; body without enamel. Height, 7; maximum diameter, 2.7 mm. U. S. Nat. Mus. Cat. No. 107917.

Off Fernandina, 15 specimens.

At first sight this shell might be mistaken for a *Melanella*. Its nearest relative seems to be *A. nitidus* Verrill, than which it is more slender, acute, and flat-sided.

ACTEON PROPIUS, new species

Shell small, white, rather slender, with a large bluntly immersed nucleus, distinct slightly shouldered suture and about five moderately

convex whorls; sculpture of evident incremental lines and microscopically minute spiral striation; aperture half as long as the shell, narrowly ovate, the pillar twisted but not distinctly plicate; base imperforate; length, 4.3; diameter, 1.7 mm. U. S. Nat. Mus. Cat. No. 107919.

Off Fernandina, two specimens.

This resembles *A. nitidus* but has the aperture longer in proportion to the total length, the suture slightly turritured and the spiral striation finer.

**ACTEON PARALLELUS, new species**

Shell minute, white, subcylindrical, with an immersed blunt apex and nearly four whorls; suture distinct, briefly shouldered; surface finely spirally striate, the striae microscopically reticulate by faint incremental lines; sides of the last whorl nearly flat, the base short, evenly rounded; outer lip thin, sharp, straight, anteriorly rounded into the slightly thickened and twisted pillar; base imperforate in the adult, a slight chink behind the pillar in immature specimens. Height, 3; maximum diameter, 1.5 mm. U. S. Nat. Mus. Cat. No. 107918.

Off Georgia and Fernandina, four specimens.

This is remarkable for its subcylindrical turritured whorls.

**ACTEON LACUNATUS, new species**

Shell small, solid, pale gray, of somewhat more than four whorls, with an immersed nucleus; apex blunt, suture distinct, not channelled, whorls only moderately convex; axial sculpture chiefly visible in the grooves, strongly reticulating them; spiral sculpture of (on the last whorl about 16) channelled deep grooves with about equal interspaces over the whole surface; aperture about half as long as the shell, outer lip simple, arcuate, rounding in front into a conspicuously thickened almost folded, short pillar, with an obvious coat of enamel across the body, the base imperforate. Length, 3; diameter, 1.8 mm. U. S. Nat. Mus. Cat. No. 108273.

Off Georgia, three specimens.

The spiral sculpture of channelled grooves is coarser than in any of the other forms mentioned.

A defective specimen found with the above (108273b.) has an acute rapidly enlarging spire, spiral punctate sculpture and a conspicuous groove in front of the suture on all five whorls; the last whorl much the largest. The base is imperforate. Length, 3; diameter 2 mm.



## Family RINGICULIDAE

## Genus RINGICULA Deshayes

## Section RINGICULINA Monterosato

## RINGICULA NITIDA Verrill

*Ringicula nitida* VERRILL, Amer. Journ. Sci., ser. 3, vol. 5, p. 16, Jan., 1873;

Trans. Conn. Acad., vol. 3, p. 48, pl. 1, fig. 2, 1874.

*Ringicula leptocheila* BRUGNONE, Misc. Malac., p. 18, fig. 11, 1873.

Off Georgia and Fernandina, numerous. Gulf of Maine to the Lesser Antilles, and on both sides of the Atlantic, in the Mediterranean and fossil in the Italian Pliocene.

## Family ACTAEONIDAE

## Genus OVULACTAEON Dall

## OVULACTAEON MEEKI Dall

*Ovulactaeon meeki* DALL, Bull. Mus. Comp. Zool., vol. 18, p. 43, pl. 33, figs. 3, 4, 1889.

Off Fernandina, 14 specimens. Also off Havana in 450 fathoms (Sigsbee), and west of North Bimini, Bahamas, in 200 fathoms, sand; Dr. W. H. Rush.

## Family ACTEOCINIDAE

## Genus VOLVULELLA Newton

## VOLVULELLA MÖRCH, new species

Shell small, white, smooth, subcylindric, attenuated at both ends, involved, the aperture as long as the shell; apex hardly pointed, aperture very narrow except in front; outer lip thin, straight, rounding in front evenly into the short twisted pillar which is hardly thickened and has a narrow furrow behind it. Height, 3.5; diameter, 1.25 mm. Cat. No. 108268, U. S. N. M.

Off Georgia, one specimen.

The shell is nearest *V. persimilis* Mörch, but is smaller and not spirally striated.

## Genus RETUSA Brown

## RETUSA RECTA Orbigny?

? *Bulla recta* ORBIGNY, Moll. Cuba, vol. 1, p. 131, pl. 4bis. figs. 17, 20, 1845.

Shell small, white, microscopically spirally striated, with about three whorls, exclusive of the prominent obliquely partly immersed nucleus; suture distinct, the whorl in front of it rather squarely shouldered but not channeled; sides parallel, rounded in front, the aperture narrow behind, with sharp, thin margin, carried back as far as the shoulder of the last whorl; pillar arcuate, simple, without a

fold. Height, 2.25; diameter, 1.5 mm. U. S. Nat. Mus. Cat. No. 107924.

Off Fernandina, one immature specimen.

Owing to the immaturity of the specimen, the identification is tentative.

Genus CYLICHNA Lovén

Section CYLICHNINA Monterosato

CYLICHNA VERRILLII Dall

*Cylichna verrillii* DALL, Bull. Mus. Comp. Zool., vol. 18, p. 54, 1889.

Shell small, slender, translucent white, the aperture as long as the shell, smooth except for faint incremental lines; apex with a shallow funicular pit, the whorls involved; shape nearly cylindrical; outer lip thin, straight, the posterior commissure receding about half a whorl; aperture very narrow except at the anterior end, where it rounds evenly into a very short slightly thickened unfolded pillar; body with hardly a wash of enamel or none; base imperforate. Height 6.5; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 107926.

Off Georgia and Fernandina, numerous specimens. Also off the coast of North Carolina in 50 to 124 fathoms, temperatures 58° to 75° F.

Subgenus PYRUNCULUS Pilsbry

PYRUNCULUS FLORIDENSIS, new species

Shell small, white, smooth, polished, the whorls involved, about four in number, the apex with a wide funicular perforation; sculpture only of faint incremental lines most prominent on the sides of the funicle; aperture as long as the shell, very narrow behind; outer lip in the adult nearly straight, broadly rounded in front, thickened on the pillar, which has a conspicuous fold not present in the young; there is a very minute chink behind the pillar lip. Height, 5.5; diameter at apex, 2.5; maximum diameter, 3.7 mm. U. S. Nat. Mus. Cat. No. 107929.

Off Fernandina, numerous specimens.

The larger size, greater rotundity, wider apical opening, and probably the conspicuous fold on the adult pillar, distinguish this from the other species of the locality.

PYRUNCULUS RUSHI, new species

Shell small, white, polished, subpyriform, the whorls involved, the apex with a deep narrow perforation; the only sculpture consists of inconspicuous incremental lines; the aperture is as long as the shell, the posterior commissure rounded over, the outer lip thin, nearly straight, broadly rounded in front; a slight bulge, not a fold, frequently noticeable where it unites with the pillar; a very narrow chink

usually exists behind the pillar. Height, 3.7; diameter at apex, 1.5; maximum diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 107922.

Off Fernandina, numerous specimens.

The species differs from 107923 by its smaller size, relatively shorter and less attenuated form, and slightly wider posterior part of the aperture. It is dedicated to the late Dr. W. H. Rush, United States Navy, to whom we were indebted for several interesting additions to the deeper water fauna.

**PYRUNCULUS MEDIUS, new species**

Shell small, white, polished, smooth, involved, the apex deeply narrowly perforate; the whorl enlarging anteriorly; aperture as long as the shell, very narrow behind, broad in front, the margin thin, sharp, straight, in front evenly rounded into the slightly thickened straight pillar; the latter has a narrow chink behind it; the posterior commissure of the aperture is evenly rounded over. Height, 5; diameter at apex, 1.5; maximum diameter, 3 mm. U. S. Nat. Mus. Cat. No. 107923.

Off Fernandina.

There is no clearly defined plait on the three specimens collected, but possibly it may develop later from the slight thickening observable.

**PYRUNCULUS CURTULUS, new species**

Shell small, short, stout, whitish, smooth, the apex perforate in the young, closed and funicular in the adult; aperture as long as the shell, the outer lip raised slightly above the level of the spire, the aperture very narrow behind, ample and evenly rounded in front; pillar short, thin, slightly arcuate, showing no indication of a plait; surface feebly marked by incremental lines. Length, 2.6; diameter, 1.5 mm. U. S. Nat. Mus. Cat. No. 108266.

Off Georgia, six specimens.

This is the smallest and most thickset relatively, of the east coast species.

**Family BULLARIIDAE**

**Genus BULLARIA Rafinesque**

**BULLARIA INDOLENS, new species**

Shell small, white, smooth, except for faint incremental lines and one or two accidental spiral striae, of about four whorls; apex a funicular pit disclosing the edge of the whorls; form a slender oval; aperture as long as the shell, narrow behind where the lip narrowly curves to the body; outer lip mostly straight, rounded into the thickened pillar which has a marked callosity at its anterior end; a narrow chink lies behind the pillar but the base is imperforate; there is a coating

of enamel on the body. Height, 7.5; diameter, 4.3 mm. U. S. Nat. Mus. Cat. No. 107928.

Off Georgia and Fernandina, two specimens.

This is very near *B. krebsi* Dall, but somewhat more slender.

Subgenus LEUCOPHYSEMA Dall

LEUCOPHYSEMA EBURNEOLA Dall, new name

*Bulla* ? *eburnea* DALL, Bull. Mus. Comp. Zool., vol. 9, p. 98, 1881; vol. 18, p. 55, pl. 17, fig. 6, 1889. Not *Bulla eburnea* A. Adams.

Shell small, ivory white, smooth, polished, with a few faint spiral striae on the base; whorls involved, the apex minutely perforate, the aperture as long as the shell, the margin roundly curved behind, gently arcuate laterally, thin, roundly curved to the short thickened pillar; the adult appears to have the umbilicus closed, younger specimens show a more or less marked perforation; and a somewhat wider apical funicle. Height, 6; diameter, 3.5 mm. U. S. Nat. Mus. Cat. No. 107925.

Off Fernandina, numerous specimens.

LEUCOPHYSEMA ABYSSICOLA Dall

Shell small, ovate, white, smooth, except for fine spiral striae near the apex; the whorls involved; apex with a shallow dimple; aperture as long as the shell; the posterior commissure narrow; outer lip thin, sharp, moderately arcuate, rounding evenly into the slightly thickened short pillar; base imperforate; body with a thin coat of enamel. Height, 4.5; maximum diameter, 3 mm. U. S. Nat. Mus. Cat. No. 107930.

Off Fernandina, six specimens.

These differ from 107925 in being smaller, proportionately shorter, and more rotund. They are probably the young of the much larger *L. abyssicola*, though I have received them under the name of *Diaphana gemma* Verrill, which is of a quite different shape.

Family SCAPHANDRIDAE

Genus SABATIA Bellardi

Section SABATINA Dall

SABATIA BATHYMOPHILA Dall

*Atys* ? *bathymophila* DALL, Bull. Mus. Comp. Zool., vol. 9, p. 98, 1881.

*Sabatia bathymophila* DALL, Bull. Mus. Comp. Zool., vol. 18, p. 53, pl. 17, figs. 9, 9b., 1889.

Off Georgia and Fernandina, numerous young specimens. Yucatan Strait, and about Cuba, in 734 to 2,805 fathoms; U. S. S. *Blake*.

**Genus SCAPHANDER Montfort****SCAPHANDER STIGMATICA, new species**

Shell much resembling *Scaphander nobilis* Verrill, from which it is best distinguished by a differential diagnosis. The body is flatter at the apex, shorter, and consequently has a more rotund appearance; the aperture especially in front, is narrower and less expanded; the sculpture in *nobilis* comprises small rounded-rectangular punctures between flattened spiral interspaces and concentric threads; in the present species the punctures are larger, circular, and close together, the intervening reticulum so fine that only toward the ends of the shell, especially in front, are the spirals wide enough to show flattening. The result of these differences is that while *nobilis* on a casual glance looks almost smooth, the present species has a roughly punctate appearance. Longitude, 38; maximum latitude, 26 mm. U. S. Nat. Mus. Cat. No. 9596.

Station 2127, United States Bureau of Fisheries, in 1,639 fathoms, greenish mud, south of Cuba. This shell was referred to as *S. nobilis* in my Blake report (pt. 2, p. 53), but under more careful microscopic scrutiny appears to be distinct. The single specimen is dead but well preserved.

**Family DIAPHANIDAE****Genus DIAPHANA Brown****DIAPHANA FLORIDANA, new species**

Shell small, inflated, thin, whitish, with an involved spire; surface smooth except for more or less conspicuous incremental lines; apex a small dimple, the posterior commissure of the aperture narrowly rounded, the anterior part expanded, rounded in front, the thin lip passing insensibly into the strongly thickened pillar-lip, with a conspicuous coating of enamel on the body. Length, 4; diameter, 3.5 mm. U. S. Nat. Mus. Cat. No. 107932.

Off Fernandina, a single specimen.

The form is slightly pyriform.

**Family PHILINIDAE****Genus PHILINE Ascanius****PHILINE LUCIDA, new species**

Shell minute, translucent white, flattish, of about two whorls, the apex depressed, minute, with a deep suture; the posterior commissure of the aperture rising roundly above the spire; surface finely spirally grooved, the grooves microscopically punctate; general outline of the depressed, last whorl ovate, the test very thin, the margin simple, the arch of the posterior commissure about equal to the curve of the spire opposite; the pillar lip slightly thickened and reflected, a thin

layer of enamel over the body; interior smooth, except for a delicate rib emerging from the spire and extending about half way to the outer lip. Height, 3.5; breadth, 2; convexity, 1.2 mm. U. S. Nat. Mus. Cat. No. 107933.

Off Fernandina, one specimen.

There is an ill-defined shallow constriction on the posterior part of the whorl, but this may be pathological.

### Family TURRITIDAE

The members of this family in the collection are numerous but all small and white or translucent. Owing to the fact that their anatomy is unknown and even the presence or absence of an operculum can not be determined, the generic names used in this paper are merely tentative. The nomenclature of the group is so unsettled and in nearly all cases based merely on the shell characters, that no final arrangement is at present possible.

There have been several attempts at classification by nuclear characters, and in some minor groups they may be useful. I have elsewhere<sup>2</sup> given my reasons for considering that the nucleus in general has no fundamental generic importance, but that its characters are adaptive, either to a swimming larval stage or one that is relatively sedentary; with minor differences due to development in shallow or deep water. There is no doubt that an abyssal habitat tends to promote a smooth swollen or even mammillary protoconch and gyrate pillar with a pervious axis. These characters are probably related to the pressure of the deep sea environment.

#### SPECIES WITH SWIMMING LARVAL STAGE AND SINUSIGERA NUCLEUS

##### DAPHNELLA? HYPERLISSA Dall

*Daphnella sofia*, var. *hyperliissa* DALL, Bull. Mus. Comp. Zool., vol. 18, No. 29 pt. 2, 108, June, 1889.

Two immature specimens off Fernandina. Also off Cape Fear, North Carolina, at station 2678, in 731 fathoms, ooze, bottom temperature 39.8° F.; United States Bureau of Fisheries.

##### GYMNOBELA IMITATOR, new species

Shell minute, white, with a *Sinusigera* nucleus of two and a half, and nearly four subsequent whorls; suture distinct, appressed; whorls only moderately convex; axial sculpture of (on the last whorl about 14) narrow, oblique ribs with wider interspaces, crossing the whorls, stronger on the earlier whorls, and ending in small close beadlike pustules in front of the suture; these ribs become obsolete on the base; spiral sculpture of a single carina near the periphery of the whorls, prominent where it intersects the ribs, and 10 or 12 fine threads in

front of the carina which slightly cut the ribs in crossing them; anal fasciole wide, extending from the carina to the coronation of the suture; base moderately convex, pillar short, smooth, obliquely truncate; outer lip thin, sharp; canal wide and short. Length, 3; diameter, 1.5 mm. U. S. Nat. Mus. Cat. No. 107958.

One specimen off Fernandina.

GYMNOBELA ? ILLICITA, new species

Shell minute, white, with a brown *Sinusigera* nucleus of two and a half and four subsequent whorls; spire acute, suture appressed, somewhat constricted; anal fasciole rather wide, crossed by retractively concave wrinkles; axial sculpture of about 10 prominent ribs, wider and slightly angulate at the periphery, varying in number in different specimens, up to 12, and extending nearly across the whorls, but obsolete on the base and on the anal fasciole; spiral sculpture of two or three prominent threads near the periphery, over riding the ribs and half a dozen smaller ones on the base; base moderately convex, aperture subovate, the outer lip thin and protractively arcuate; pillar straight, obliquely truncate in front; canal rather wide, slightly recurved. Length, 3.5; diameter, 1.2 mm. U. S. Nat. Mus. Cat. No. 107942.

Five specimens off Fernandina.

GYMNOBELA ? LANCEATA, new species

Shell minute, white, acute, with a *Sinusigera* nucleus of four and two subsequent whorls; suture appressed, bordered in front by close, short, axial wrinkles; anal fasciole slightly concave, wide, extending to the angle at the shoulder; axial sculpture of about 15 low, short oblique ribs most prominent at the shoulder, with wider interspaces and obsolete in front of the periphery; spiral sculpture of faint spiral striations visible only under the lens; aperture subovate, canal long, narrow, straight, pillar straight, attenuated in front. Length, 3; diameter, 1.5 mm. U. S. Nat. Mus. Cat. No. 107962.

One specimen off Fernandina, perhaps immature.

GYMNOBELA ? GRUNDIFERA, new species

Shell small, biconic, white, with a brown rounded *Sinusigera* nucleus of three and three subsequent whorls; suture appressed, minutely crenulated by the ends of the axial sculpture in front of it; anal sulcus wide and only moderately deep; the fasciole wide, sculptured with retractively arcuate, sharp, elevated lines; other axial sculpture of well marked incremental lines, and faint narrow indications of obsolete ribbing; spiral sculpture of a single strong peripheral keel, about eight slender low threads with wider interspaces in front of it, minutely crenulate by the axial sculpture, and much closer fine threading on the canal; base moderately rounded; pillar straight, attenuated in

front; canal short, wide, outer lip thin, arcuate. Length, 5.2; diameter, 3.3 mm. U. S. Nat. Mus. Cat. No. 107945.

Five specimens off Fernandina.

Probably immature but quite characteristic.

MANGILIA? IPARA Dall

*Pleurotoma (Mangilia) ipara* DALL, Bull. Mus. Comp. Zool., vol. 9, p. 57, Aug., 1881; vol. 18, No. 29, pt. 2, p. 115, pl. 11, fig. 14, June, 1889.

Two young specimens off Fernandina. Also from the Yucatan Strait in 640 fathoms and near Martinique in 502 fathoms.

This species may belong to the genus *Gymnobela*.

MANGILIA? SERICIFILA, new species

Shell minute, pale buff, with a brown *Sinusigera* nucleus of three and four subsequent well rounded whorls; suture appressed with a fine thread in front of it; anal sulcus wide and shallow, leaving a wide fasciole, arcuately striated behind it; in front of the fasciole there is an obscure shoulder to the whorl; axial sculpture of incremental lines, most conspicuous on the fasciole, and a double row of obscure undulations at the periphery, most marked on the earlier whorls; spiral sculpture of 10 or 12 equal, small threads in front of the periphery with narrow interspaces; base evenly rounded, canal short, wide; the pillar straight, attenuated in front; aperture ovate, the outer lip thin, arcuate. Length, 4; diameter 1.5 mm. U. S. Nat. Mus. Cat. No. 108302.

One specimen off Georgia.

A variety from the same locality has the peripheral undulations absent and evenly rounded and spirally sculptured whorls, giving somewhat the aspect of an *Astyris*.

MANGILIA (SERICIFILA, var.?) STRONGYLA, new

Shell resembling *sericifila* in size and general aspect, but with the whorls evenly rounded and covered with spiral sculpture of equal and equally distributed close set small threads. The axis is minutely pervious. U. S. Nat. Mus. Cat. No. 107943.

One specimen off Georgia, and a dozen off Fernandina.

PLEUROTOMELLA? STEARINA, new species

Shell small (immature?); thin, of a greasy translucent white, with a brown *Sinusigera* nucleus of three, and three subsequent, rapidly enlarging whorls; suture appressed with gathered axial wrinkles in front of it; anal sulcus shallow and wide, distally rounded, the fasciole wide, slightly constricted, arcuately striated; axial sculpture of from 12 to 15 short, rounded, obliquely arcuate ribs with subequal interspaces, confined to the region between the fasciole and the periphery of the whorl; the lines of growth are obscure; spiral sculpture



on the earlier whorls of an obscure shoulder in front of the fasciole, and over the whole shell fine even spiral striae, with flattish wider interspaces which on the canal become threadlike; aperture rather narrow, pillar straight, attenuated in front, outer lip thin and arcuate. Length, 5.6; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 1083100.

Three specimens, off Georgia.

**PLEUROTOMELLA? CORRIDA, new species**

Shell minute, white, with a small *Sinusigera* nucleus of three, and four and a half subsequent well rounded whorls, suture appressed and constricted; anal sulcus deep, the fasciole narrow and close to the suture; axial sculpture of 11 prominent rounded ribs with wider interspaces, crossing the whorls from the fasciole nearly to the pillar; spiral sculpture of 4 or 5 fine, sharp threads with wide interspaces, a little swollen where they cross the ribs, and finer threadlets in the interspaces and on the base; base well rounded, pillar short, straight, gyrate with pervious axis; canal short; outer lip arcuately produced, thin, sharp. Length, 4.7; diameter, 2.0 mm. U. S. Nat. Mus. Cat. No. 107947.

Two specimens off Fernandina and one off Georgia.

**PLEUROTOMELLA? (EUCYCLOTOMA) APERTA, new species**

Shell small (immature), white, thin, with a brown *Sinusigera* nucleus of three and two subsequent rapidly enlarging whorls; suture distinct, not appressed; anal sulcus wide and shallow, the fasciole flattish, with arcuate axial sculpture; spiral sculpture on the first normal whorl of a prominent peripheral keel and a second which is covered by the suture; on the second whorl there are two such crenulate keels one on each side of the periphery, with a wide interspace and and three less prominent on the base; axial sculpture of incremental lines which are periodically stronger; there are also half a dozen fine threads on the canal; base only moderately rounded, canal short, wide; pillar straight, attenuated anteriorly, gyrate, with a pervious axis; outer lip thin, the aperture very wide. Length, 4.5; diameter, 2.8 mm. U. S. Nat. Mus. Cat. No. 108306.

One specimen off Georgia.

Though doubtless immature the characters of the species are so emphatic that it can not fail to be identified.

**EUBELA LIMACINA Dall**

*Pleurotoma (Bela) limacina* DALL, Bull. Mus. Comp. Zool., vol. 9, p. 55, Aug. 1881.

*Daphnella limacina* DALL, Bull. Mus. Comp. Zool., vol. 9, p. 102, Oct., 1881.

*Pleurotoma (Defrancia) hormophora* WATSON, Linn. Soc. Journ., vol. 15, p. 457, Nov. 3, 1881.

*Clathurella hormophora* WATSON, Challenger Gastropods, p. 351, pl. 21, fig. 9, 1885.

*Daphnella limacina* VERRILL, Trans. Conn. Acad., vol. 5, p. 452, 1882; vol. 6, p. 265, 1884.

*Daphnella (Eubela) limacina* DALL, Bull. Mus. Comp. Zool., vol. 18, p. 106, pl. 9, fig. 10, June, 1889; U. S. Nat. Mus. Bull. 37, p. 100, pl. 9, fig. 10, 1889.

Six specimens off Fernandina. Also in deep water from off Marthas Vineyard, Mass., to the South Atlantic off Pernambuco, Brazil, in from 85 to 805 fathoms.

SPECIES WITH A SWIMMING LARVAL STAGE AND THE NEPIONIC WHORLS FOLLOWED BY A TRANSITIONAL ARCUATELY RIBBED WHORL

#### MANGILIA (TURRIDRUPA) COMATOTROPIS DALL

*Pleurotoma (Mangilia) comatotropis* DALL, Mus. Comp. Zool., vol. 9, p. 58, Aug. 1881.

*Pleurotoma (Mangilia) tiara* WATSON, Linn. Soc. Journ., vol. 10, p. 440, Oct., 1881; Challenger Gastropods, p. 347, pl. 21, fig. 7, 1885.

*Pleurotoma comatotropis* VERRILL, Trans. Conn. Acad., vol. 5, p. 452.

*Taranis pulchella* VERRILL, Trans. Conn. Acad., vol. 5, p. 487, pl. 57, fig. 17 (young) June, 1882; vol. 6, p. 267, pl. 29, fig. 8, 1884.

*Mangilia comatotropis* DALL, Bull. Mus. Comp. Zool., vol. 18 p. 116, pl. 11, fig. 12, 1889; Bull. 37, U. S. Nat. Mus., p. 102, pl. 11, fig. 12, 1889.

Numerous specimens off Georgia and Fernandina.

This has the general form of *Asthenotoma cicatrigula* Hedley, and the nucleus of *Turridrupa pertinax* Hedley, both Australian forms.

SPECIES WITH A SWIMMING LARVAL STAGE AND SINUSIGERA NUCLEUS WITH A PERIPHERAL KEEL

#### PLEUROTOMELLA? LINEOLA, new species

Shell small, thin, white, with a *Sinusigera* nucleus of two and a half brown whorls and three and a half subsequent well rounded whorls; suture closely appressed, somewhat constricted; anal sulcus deep and wide, the fasciole close to the suture, crossed by retractively arcuate wrinkles; axial sculpture of about 16 very narrow sharp ribs, with much wider interspaces, completely crossing the whorls except the anal fasciole; spiral sculpture of (on the last whorl 6) slender threads with much wider interspaces, so that the interstices of the reticulation are nearly square; the canal is finely spirally threaded; pillar short, straight, attenuate in front, gyrate, with pervious axis; aperture narrow, outer lip thin, arcuately produced in front. Length, 5.5; diameter, 2.25 mm. U. S. Nat. Mus. Cat. No. 333529.

Three specimens off Fernandina.

This species has nucleus markedly spirally unicarinate, while in most of the species with the *Sinusigera* nucleus the whorls are rounded.

SPECIES WITH A SWIMMING LARVAL STAGE AND WITH THE NEPIONIC SHELL SPIRALLY KEELED AND THE AXIAL SCULPTURE STRONG

#### MANGILIA ISCHNA, new species

Shell minute, glassy white, slender, acute, with a four-whorled brown nucleus in which the nepionic part is prominently peripherally

keeled and the axial lines of the reticulum are prominent; the whole is followed by two or more translucent whorls on which the keels gradually disappear; suture distinct, not appressed; anal sulcus shallow, the fasciole indistinct; spiral sculpture of faint sparse spiral striae only visible under magnification; axial sculpture practically none; last whorl evenly rounded, with a long twisted, straight pillar, with a minutely pervious axis; aperture narrow, outer lip thin and sharp. Length, 4.6; diameter, 1.3 mm. U. S. Nat. Mus. Cat. No. 107950.

One specimen off Fernandina.

*PLEUROTOMELLA? VAGINATA*, new species.

Shell small, whitish, subtabulate, with a small brownish nucleus of two whorls, the nepionic part of which is unicarinate and the axial threads prominent, followed by four well rounded, strongly sculptured whorls; suture distinct, constricted; anal sulcus deep but narrow, the fasciole narrow and close to the suture, somewhat excavated behind a prominent shoulder, giving a tabulate aspect to the whorls; axial sculpture of (on the last whorl 11) rounded somewhat flexuous ribs with much wider interspaces, the incremental lines obscure; spiral sculpture of numerous equal fine threads, sometimes alternated in size and sometimes not; but in general covering more or less closely the whole shell; aperture subovate, outer lip thin; pillar short, straight with a previous axis. Length, 5.3; diameter, 2.3 mm. U. S. Nat. Mus. Cat. No. 108305.

Off Georgia, nine specimens.

SPECIES WITH A SWIMMING LARVAL STAGE, THE NUCLEAR AXIALS OBSOLETE AND A CARINA EMPHASIZED

*MANGILIA ACROCARINATA*, new species

Shell small, acute, pale brown when fresh, with a short sharply unicarinate nucleus of two, and six subsequent whorls; suture distinct, appressed; anal sulcus shallow and rounded, the fasciole extending between the suture and the shoulder of the whorl, flattish and smooth except for incremental lines; axial sculpture of (on the last whorl 10) extremely short ribs which appear chiefly as pointed nodules on a peripheral minute keel and again as faint pustules on a thread near the margin of the base; with wider interspaces; spiral sculpture of the above mentioned thread and keel, and a few fine close threads on the short canal; the general surface of the shell is polished with a waxy luster; base flattish; aperture ovate, short; canal wide, pillar attenuated in front, axis impervious. Length, 6.5; diameter, 2.7 mm. U. S. Nat. Mus. Cat. No. 107944.

Twenty specimens off Fernandina.

SPECIES WITH A SEDENTARY LARVAL STAGE AND A SMOOTH INFLATED WHITE NUCLEUS OF FEW WHORLS

## PHILBERTIA ? PERDECORATA, new species

Shell small, translucent white, strongly sculptured, with a nucleus of a whorl and a half and five and a half subsequent whorls; suture distinct, appressed; axial sculpture of (on the last whorl 10, beside the apertural varix) rounded equal ribs with wider interspaces, crossing the whorls but obsolete more or less on the last half of the last whorl behind the varix; the incremental lines inconspicuous; spiral sculpture of (on the spire 3, on the last whorl 4 behind the suture, and about 16 on the base and canal) sharp threads with subequal interspaces, over riding the ribs; base rounded, canal very short; aperture small, ovate, the outer lip heavily varicose with a thin inflected edge; the anal sulcus large, shallow, and rounded, leaving a very feeble fasciole; the inner lip and body callous, the canal short and wide. Length, 8.5; diameter, 4.3 mm. U. S. Nat. Mus. Cat. No. 108291. The short one is 7 mm. long.

Off Georgia, very common, perhaps the most numerous species of the collection, but mostly blackened by manganese.

The outer lip is so generally defective or immature that I am able to find only one specimen complete out of the whole series, and that one happens to be a whorl shorter than the average specimen.

None was found off Fernandina.

## PHILBERTIA PERDECORATA, variety? LIONTA, new

Shell small, slender, elongate, white, with a nuclear apex of two and five subsequent whorls; suture distinct, appressed; the anal sulcus very shallow, the fasciole hardly depressed, obscure, axially wrinkled near the suture; whorls moderately rounded; axial sculpture of (on the penultimate whorl 16) narrow straight ribs with wider interspaces, crossing the whorls on the spire but obsolete or entirely absent over the greater part of the last whorl, which ends in mature specimens with a strong varix; incremental lines feeble; spiral sculpture as in *perdecorata* but less emphatic, the threads on the spire crenulating the summits of the ribs slightly; mature aperture much as in *perdecorata*. Length, 11; diameter, 4 mm. U. S. Nat. Mus. Cat. No. 333445.

Eighteen specimens off Fernandina and three or more off Georgia.

This differs from *perdecorata* in its less emphatic ribs and more feeble sculpture, more numerous ribs, and somewhat more slender form; it seems to take the place of *perdecorata* in the material collected off Fernandina. However, there are some intermediate specimens.

## PHILBERTIA ? EXTENUATA, new species

Shell small, slender, whitish, with a smooth nucleus of a whorl and a half and six subsequent moderately rounded whorls; suture distinct,

not appressed; axial sculpture of (on the penultimate whorl about 18) protractively oblique narrow close set equal ribs crossing the whorls on the spire, obsolete on the base and pillar; incremental lines feeble; spiral sculpture of faint obscure threads between the ribs, and two sharp grooves at the margin of the base, which seem to duplicate the suture when one of them is exposed; the base is free from ribs but behind the aperture is a well defined hump or varix; outer lip produced in front, the anal sulcus shallow leaving an ill-defined fasciole, aperture narrow, canal short and wide. Length, 11; diameter, 4 mm. U. S. Nat. Mus. Cat. No. 108298.

Off Georgia, a dozen worn specimens.

**CLATHRODRILLIA INIMICA, new species**

Shell minute, white, with a smooth nucleus of one and a half to two whorls, and five subsequent prominently sculptured whorls; suture distinct, appressed; the edge in front thickened and undulated by the sculpture, the anal sulcus shallow but the fasciole constricted and nearly smooth; axial sculpture of (on the last whorl 16) narrow, nearly straight rounded ribs with subequal or narrower interspaces, crossing the whorls from a slight shoulder in front of the anal fasciole to the succeeding suture and becoming gradually obsolete on the base; the incremental lines are well marked; spiral sculpture on the second normal whorl 3, on the next 4, and on the last whorl 10 slender threads with wider interspaces, overrunning the ribs and in front of these finer close-set threads on the pillar; aperture hardly wider than the canal, the outer lip thin, arcuately produced in front, pillar very short, attenuated in front. Length, 6.6; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 108292.

Off Georgia, about 25 specimens.

This has the general aspect of *P. perdecorata* but is smaller, with a more constricted fasciole and more numerous spirals. It also wants the varicose and inflected outer lip.

**CLATHRODRILLIA ORELLANA, new species**

Shell small, slender, whitish, with a smooth nucleus of one and a half, and four and a half subsequent whorls; suture distinct, not constricted or appressed; anal sulcus wide and shallow, the fasciole not excavated, inconspicuous; axial sculpture of protractively flexuous incremental lines, stronger near the apex, and in some cases feeble narrow ribs are developed on the earlier whorls, with wider interspaces; spiral sculpture of very fine threads, equal and with subequal interspaces, though a little coarser on the well-rounded base; aperture slightly wider than the canal, the outer lip thin, flexuous, sometimes a feeble thickening behind it; the whorls are usually rounded but sometimes there is a slight shoulder in front of the fasciole; pillar

short, attenuated in front, canal short and wide. Length, 7.4; diameter, 3.5 mm. U. S. Nat. Mus. Cat. No. 108293.

Off Georgia, six specimens.

The sculpture varies in strength with the individual, the form taken as typical is practically without ribs.

*CLATHRODRILLIA DOLANA*, new species

Shell small, whitish, with a smooth nucleus of a whorl and a half, and five subsequent moderately rounded whorls; suture distinct, hardly appressed, the anal fasciole nearly smooth, hardly concave; axial sculpture of (on the last whorl about 16, exclusive of the varix) narrow, small, very flexuous ribs, sometimes a little angular in front of the fasciole, with equal or narrower interspaces obsolete on the base; spiral sculpture of (between the sutures 3) fine conspicuous threads with wider interspaces, overriding the ribs; on the base and canal about 10 more diminishing forward; aperture little wider than the canal; anal sulcus shallow, rounded, outer lip thin, not inflected, protractively flexuous; pillar short, attenuated in front; canal short, wide. Length, 6.5; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 107934.

Numerous specimens from off Fernandina.

*CLATHRODRILLIA FANO*, new species

Shell small, white, strongly sculptured, the aperture shorter than the spire; with a smooth protoconch of a whorl and a half, and half a whorl of transitional thin sharp axial riblets before the latter assume the adult characters on the four subsequent whorls; suture appressed, the fasciole in front of it narrow and obscure; whorls well rounded; axial sculpture of 13-14 rounded ribs (on the last whorl) with wider interspaces, crossing the whorls on the spire, obsolete on the base; incremental lines not conspicuous; spiral sculpture of three strong cords, overriding the ribs; and about a dozen smaller plain threads on the base and canal; aperture rather narrow, anal sulcus very shallow, outer lip sharp, protractively arcuate, thin; pillar straight, somewhat gyrate but with an impervious axis; attenuated in front; canal rather long and wide. Length, 7; diameter, 3.1 mm. U. S. Nat. Mus. Cat. No. 107957.

Off Fernandina, five specimens.

*SUAVODRILLIA TEXTILIA*, new species

Shell small, vitreous white, with an inflated smooth nucleus of two and four subsequent whorls; suture distinct, not constricted or appressed, the fasciole in front of it conspicuous; axial sculpture of well-marked incremental lines and (on the last whorl about a dozen) protractively flexuous ribs with equal or wider interspaces, these are

well marked on the spire where they cross the whorls, slightly shouldered in front of the fasciole, but less well defined on the last whorl and obsolete on the base; there is also a varical swelling behind the outer lip in the mature shell; spiral sculpture of almost invisible minute striae covering the whole surface; aperture ovate, the outer lip thickened and inflected, the anal sulcus wide and shallow; pillar short, canal very short and wide; the last whorl more than half as long as the shell. Length, 8; diameter, 2.7 mm. U. S. Nat. Mus. Cat. No. 333449.

One off Fernandina, seven off Georgia.

*DAPHNELLA? SAGENA, new species*

Shell small, vitreous white, few whorled, the last whorl much the largest; with a smooth nucleus of a whorl and a half and somewhat more than three and a half subsequent whorls; suture inconspicuous, not constricted, the fasciole feebly marked; axial sculpture of (on the last whorl about a dozen) low rounded ribs with much wider interspaces, crossing the whorls, and well-marked close incremental lines; spiral sculpture of (on the first adult whorl 2, on the next 3, and on the last whorl 8 or 9) sharp fine threads with much wider interspaces, a little swollen where they override the ribs, and forming by the intersection a rather open reticulum; in the interspaces are very fine close spiral striae; this sculpture covers the shell; aperture narrow, hardly wider than the canal, the anal sulcus very shallow, the outer lip hardly thickened; pillar short and straight, axis impervious. Length, 5; diameter, 2.2 mm. U. S. Nat. Mus. Cat. No. 108311.

Two specimens off Georgia, 28 off Fernandina. A single specimen more slender than the others is otherwise identical.

*DAPHNELLA? EPOMIS, new species*

Shell minute, white, slender, with a small smooth nucleus of about one whorl, and three subsequent whorls; suture distinct, not appressed, the fasciole in front of it flattish, the anterior margin of the fasciole forming a more or less angular shoulder to the whorl; axial sculpture of very fine incremental lines and at and near the shoulder of feeble fine flexuous wrinkles, stronger on the spire; spiral sculpture of very fine close striae over the whole surface except a few threads on the canal; the last whorl equals about two-thirds the whole length; aperture narrow, the canal hardly differentiated, outer lip (immature?) thin and sharp, the anal sulcus obscure; pillar straight, attenuated in front, axis impervious. Length, 6.3; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 107966.

Off Fernandina, one specimen.

*MANGILIA ? CHASMATA, new species*

Shell small, slender, white, the aperture about half the length, with a blunt smooth nucleus of a whorl and a half, and three and a half subsequent whorls; suture appressed and slightly coronated by the swollen ends of the ribs; the fasciole slightly constricted, its anterior edge forming an angular shoulder; axial sculpture of (on the last whorl about 20) narrow rather straight rounded ribs with equal or wider interspaces crossing the whorls, flexuous on the fasciole; spiral sculpture none, even the back of the canal is smooth; aperture narrow, the canal hardly differentiated, the anal sulcus wide and shallow, the pillar straight, attenuated in front, axis impervious. Length, 5.5; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 107964.

Off Fernandina, 20 specimens.

*MANGILIA LASTICA, new species*

Shell small, slender, whitish, the aperture about one-third the whole length, with a smooth nucleus of one and a half to two whorls and seven subsequent well rounded whorls; suture distinct, not appressed, the fasciole in front of it flattish and sloping; the sculpture varying in strength in different individuals; usually stronger on the earlier whorls; axial sculpture of numerous protractively oblique narrow ribs with subequal interspaces, flexuous but not prominent (as a rule) on the fasciole and absent from the base, the incremental lines inconspicuous; spiral sculpture of two equal threads just behind the suture, but not equally obvious in all the specimens, especially the young; in those with strong sculpture there are two or three more or less evident small threads overriding the ribs, but in all young cases the base is smooth, the ribs stopping abruptly; in the fully adult there may be a few obsolete spirals on the base, and a few evident ones on the canal; aperture subovate with a wide and short canal; outer lip protractively arcuate, the anal sinus shallow and wide; the pillar short, attenuated in front, axis impervious. Length, 11; diameter, 4 mm. U. S. Nat. Mus. Cat. No. 107967.

Off Fernandina, 25 specimens.

A variety, with stronger sculpture has a short nucleus, and the spirals continuous over the base, the two near the suture less evident.

*MANGILIA ? TACHNODES, new species*

Shell small, lucid white, slender, with a very short nuclear whorl and five and a half subsequent whorls; suture distinct, constricted, not appressed, the fasciole in front of it flattish, its anterior edge angular, forming a conspicuous shoulder to the whorls; axial sculpture of (on the last whorl about 25) threadlike ribs, stronger on the earlier whorls, with subequal interspaces, crossing from suture to



suture, sharply nodulous at the shoulder and obsolete on the base; incremental lines inconspicuous; spiral sculpture of (on the spire three, on the last whorl six or seven, alternating in strength) sharp threads, prominently nodulous where they override the ribs; base and pillar smooth; aperture ovate, about one-fourth the whole length, canal hardly differentiated, pillar very short; outer lip sharp, anal sulcus wide and shallow. Length, 7.5; diameter, 2.2 mm. U. S. Nat. Mus. Cat. No. 333446.

One specimen, off Fernandina.

The strong rather sharp sculpture gives this form a peculiarly elegant appearance.

**MANGILIA? CROSSATA, new species**

Shell small, resembling a *Lora* in shape, white, biconic, the aperture more than half the total length, polished, with a very short smooth nuclear whorl and three subsequent whorls; suture distinct, appressed, coronated by the ends of the ribs; spire very short, whorls with a subangular shoulder; axial sculpture of (on the last whorl about a dozen) narrow elevated ribs with wider interspaces extending from the suture to the base where they become obsolete, minutely nodulous where they cross the angle at the shoulder; spiral sculpture of faint fine threading on the canal and the anterior part of the base; aperture narrow, canal hardly differentiated, anal sulcus shallow; pillar straight, attenuated in front, outer lip thin, sharp, nearly straight, axis impervious. Length, 6; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 107959.

Six specimens, off Fernandina.

**MANGILIA? CRYERA, new species**

Shell much resembling *M. crossata*, but thinner, more glassy, averaging smaller, with no coronation at the suture, and with a faint pervasive spiral striation. Length, 5; diameter, 2.1 mm. U. S. Nat. Mus. Cat. No. 107960.

Numerous both off Fernandina and Georgia.

This species, like most of these deep water gastropods varies in the strength of its sculpture, and a few specimens have the shoulder angle obsolete or completely rounded off.

**MANGILIA? CHRISTINA, new species**

Shell small, thin, slender, lucid white, with a large swollen nucleus of a whorl and a half and nearly four subsequent whorls; suture distinct, not appressed or marginated; fasciole in front of it obscure but giving rise to a distinct shoulder not far from the suture; aperture about half the length of the shell; the whorls flattish; axial sculpture of (on the last whorl or a dozen) narrow, nearly straight ribs, with wider interspaces, obsolete on the base, but occasionally a little nod-

ulous at the shoulder; spiral sculpture hardly discernable or none, even on the canal; aperture narrow, anal sulcus feeble, canal hardly differentiated; outer lip straight, thin and sharp; pillar straight attenuated in front, axis impervious. Length, 6.5; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 107937.

Abundant off Fernandina.

**MANGILIA FRITILLARIA, new species**

Shell small, slender, white, with a smooth nucleus of a whorl and a half and three and a half subsequent whorls; suture distinct, appressed, coronated by the ends of the ribs in front, the fasciole sloping, hardly constricted; axial sculpture of (on the last whorl about a dozen) narrow nearly straight ribs, with wider interspaces, strongest at the shoulder, obsolete on the base and toward the end of the last whorl; spiral sculpture of (on the last whorl about 14) obsolete, close set, hardly perceptible equal and equally distributed small threads covering the whorl in front of the shoulder; aperture narrow, about two-fifths the whole length, anal sulcus feeble, canal hardly differentiated; pillar straight, attenuated in front, axis impervious. Length, 6; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 107968.

One specimen off Fernandina.

This belongs to the same group as *M. christina*, differing in details of sculpture. Until we know the range of variation in these deep-sea species it seems most convenient to treat marked differences as specific. The whorls in this species are only moderately rounded and distinctly angular at the shoulder.

**MANGILIA? SUBCIRCULARIS, new species**

Shell small, slender, thin, with a blunt apex, whitish, glistening; with a swollen nucleus of a whorl and a half and four and a half subsequent well rounded whorls; suture distinct, appressed, with a smooth, hardly constricted fasciole in front of it; axial sculpture chiefly of rather strong flexuous incremental lines and a few gradually obsolescent riblets on the earlier whorls; spiral sculpture of (on the last whorl 18-20) fine prominent threads rising above the incremental lines, with wider interspaces, covering the whole whorl in front of the fasciole; aperture ovate, about one-third the whole length, the anal sulcus forming nearly a semicircle, the outer lip thin and arcuate, canal wide; pillar twisted, attenuated in front; axis impervious. Length, 8.0; diameter, 2.7 mm. U. S. Nat. Mus. Cat. No. 333450.

Two specimens off Georgia.

The thin, glistening shell and rotund whorls are its conspicuous characters.

## MANGILIA? PERCOMPACTA, new species

Shell minute, solid, whitish, the nucleus lost, but three and a half subsequent whorls remain; suture distinct, constricted, with a fringe of minute axial wrinkles on the fasciole in front of it; there is no other axial sculpture except faint incremental lines; spiral sculpture of (on the last whorl about 10) fine, equal and equally distributed low threads with narrower interspaces, covering the whole shell except the anal fasciole; aperture ample, hardly differentiated from the short canal; anal sulcus wide and rather deep; outer lip prominently arcuate; pillar short, twisted, strong; axis minutely pervious. Length, 2.3; diameter, 1.3 mm. U. S. Nat. Mus. Cat. No. 108301.

One specimen off Georgia.

This is perhaps not a *Mangilia* but may be tentatively placed here in the absence of a knowledge of the animal. The only other species which approaches it in form which I have been able to discover is the much larger "*Daphnella*" *nana* Lovén.

## MANGILIA? ACLONETA Dall

*Drillia*(? *dalli* Verrill, var.) *acloneta* DALL, Bull. Mus. Comp. Zool., vol. 18, p. 92, June, 1889.

This is much smaller when adult than the typical *dalli*. It occurs abundantly at both stations 2415 and 2668, and was also obtained off Martinique, in 170 fathoms.

The typical *acloneta* is smooth, but has occasionally a slight angle at the shoulder and a few obscure riblets on the earlier whorls. U. S. Nat. Mus. Cat. No. 87332.

Another form which is probably an extreme variety of *acloneta*, has a strong shoulder angle, the obsolete ribbing is carried on over all the whorls and the base is spirally threaded. This was named at the same time as *acloneta*, variety *cestrota*. A single specimen was obtained off Fernandina; U. S. Nat. Mus. Cat. No. 107935.

Variety *cestrota* was also obtained at station 2399, in 196 fathoms, mud, temperature 51.6°, in the Gulf of Mexico, between the delta of the Mississippi and Cedar Keys, Florida, by the U. S. S. *Blake*.

## MANGILIA? CRATERA, new species

Shell small, white, solid, nearly smooth with a large smooth nucleus of about two whorls and four and a half subsequent whorls; suture distinct, not appressed, the fasciole in front of it obscure, not constricted; the only sculpture on typical specimens consists of feeble incremental lines; there are faint indications of ribbing on some of the worn specimens which may belong to this species; whorls well rounded and rather rapidly increasing in diameter; aperture ample, anal sulcus wide and shallow; outer lip slightly thickened and inflected; canal wide, hardly differentiated; pillar short and strong, the axis impervious. Length, 8.5; diameter, 4 mm. U. S. Nat. Mus. Cat. No. 107946.

Fifteen specimens and fragments off Fernandina; one fragment off Georgia.

This is of the same general type as *M. acloneta*, but the whorls increase in size much more rapidly.

*MANGILIA? AREIA*, new species

Shell small, white, with a swollen nucleus of a whorl and a half and nearly four subsequent whorls; suture distinct, appressed, constricted, with a conspicuous line of pustules in front of it, the fasciole very narrow and obscure, the whorl in front of it with a rounded shoulder; axial sculpture of (on the last whorl about a dozen) straight, narrow ribs, prominent at the shoulder, obsolete on the base, and with wider interspaces; the incremental lines are inconspicuous; spiral sculpture of (on the penultimate whorl 5 or 6) low threads slightly corrugating the summits of the ribs; on the last whorl in the adult they extend from the shoulder to the canal, where they are somewhat coarser; aperture sublunate, hardly differentiated from the canal; anal sulcus very feeble, outer lip thin, canal straight, attenuated in front, the axis imperious. Length, 8; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 107954.

Two specimens and some fragments from off Fernandina.

The specimen may not be entirely mature.

*MANGILIA? LORAEFORMIS*, new species

Shell short, small, polished, whitish, solid, with a large nucleus of a whorl and a half and three and a half subsequent whorls; suture distinct, not appressed, the fasciole inconspicuous, the whorls moderately rounded, the aperture about half the whole length; axial sculpture of more or less obscure folds, stronger on the early whorls, seldom differentiated into distinct ribs, sometimes forming a rounded shoulder to the whorls; beside these there are irregularly distributed incremental lines; there is no indication of any spiral sculpture; aperture narrow, the anal sulcus hardly evident, the outer lip straight, thin or very slightly thickened; pillar straight, axis not pervious. Length, 4.5; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 108308.

Off Fernandina, about 30 specimens.

Except for its obsolete sculpture it bears the aspect of a *Lora*.

*MANGILIA? PELAGIA* Dall

*Pleurotoma (Mangilia) pelagia* DALL, Bull. Mus. Comp. Zool., vol. 9, p. 61 August, 1881.

*Mangilia pelagia* DALL, Bull. Mus. Comp. Zool., vol. 18, p. 117, pl. 11, fig. 9, June, 1889.

One specimen off Georgia. Also at Blake station 44, in 539 fathoms, in the Gulf of Mexico, bottom temperature 39.5° F.

**MANGILIA ? RHABDEA, new species**

Shell white, with a smooth nucleus of about one whorl and three subsequent nearly cylindrical whorls; suture distinct, not appressed, anal fasciole faintly indicated; axial sculpture only of obscure incremental lines; spiral sculpture of on the last whorl only, a faint suggestion of an angle at the shoulder; aperture narrow, about two-fifths as long as the shell; outer lip thin, protractively arcuate; anal sulcus wide and deep; pillar straight, canal hardly differentiated. Length, 4.5; diameter, 1.5 mm. U. S. Nat. Mus. Cat. No. 107949.

One specimen, off Fernandina.

Although the specimen is defective and possibly immature, the characters are so distinctive that it can not fail to be recognized.

**CYMATOSYRINX EBUR, new species**

Shell small, white, solid, with a swollen nucleus of a whorl and a half and five and a half subsequent whorls; suture distinct, not appressed, with a slightly constricted fasciole in front of it; axial sculpture of (on the last whorl 10-11) rounded flexuous smooth ribs, most prominent at the periphery on the spire, sigmoidly flexed on the last whorl and absent from the base; the interspaces are equal or wider than the ribs; there is no spiral sculpture; the aperture is wide, less than a third of the whole length, the anal sulcus wide and deep, the outer lip very prominently protractively arcuate, the pillar short, the canal short and wide, the axis not pervious. Length, 8; diameter, 3.2 mm. U. S. Nat. Mus. Cat. No. 107948.

Off Fernandina, about 20 specimens.

There are several other species of this family represented by young or fragmentary specimens too imperfect to serve for a satisfactory diagnosis.

**Family CANCELLARIIDAE****Genus ADMETE Kroyer****Section MICROCANCILLA Dall, 1924****ADMETE MICROSCOPICA Dall**

*Cancellaria? microscopica* DALL, Bull. Mus. Comp. Zool., vol 18, p. 131, 1889.

*Admete (Microcancilla) microscopica* DALL, Proc. Biol. Soc. Wash., vol. 37, p. 87, 1924.

Shell small, short, wide, white with a small, smooth, white blunt nucleus of a whorl and a half and about two and a half subsequent whorls; whorls convex, suture distinct, deep, with a marked shoulder in front of it; axial sculpture of (on the last whorl about 14) low rounded nearly vertical ribs with narrower interspaces, crossing the periphery, obsolete on the base; and very faint incremental lines; spiral sculpture of (on the last whorl about 9) equal and equally spaced slender threads with wider interspaces, reticulating but not nodulat-

ing the axials; aperture subtriangular, the margin continuous, thin, smooth, the pillar lip reflected, with a narrow umbilicus in the adult but none in the young; the pillar shows no plaits, from in front none are visible; the anterior end of the aperture not channelled. Length of shell, 4; of aperture, 2; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 107987.

Off Georgia and Fernandina; also Campeche Bank and off Yucatan in 200 to 780 fathoms.

This exact position of this species in the family is doubtful; the plaits are generally absent at the aperture, and the internal pillar shows only one rather strong plait, yet in every other respect it agrees well with such species as *A. couthouyi* Jay.

ADMETE NODOSA Verrill and Smith

*Admete nodosa* VERRILL and SMITH, Trans. Conn. Acad., vol. 6, pt. 2, p. 419, pl. 44, fig. 9, 1885,

Off Fernandina, three young shells probably of this species. Also off Nantucket and south of Long Island, New York, in 816 and 924 fathoms.

The shell has two well marked plaits.

Family OLIVELLIDAE

Genus OLIVELLA Swainson

OLIVELLA TUBULATA Dall

*Olivella tubulata* DALL, Bull. Mus. Comp. Zool., vol. 18, p. 136, 1889.

Off Fernandina, a fragment of this species was obtained.

OLIVELLA BULLULA Reeve

*Olivella bullula* REEVE, Conch. Icon., *Oliva*, pl. 30, fig. 96, 1850.

Off Fernandina, one juvenile specimen.

It was found by the *Blake* about Cuba, off Sombrero and St. Vincent, West Indies, in 72 to 464 fathoms.

Family MARGINELLIDAE

Genus MARGINELLA Lamarck

Subgenus MARGINELLA s. s.

MARGINELLA FERNANDINAE, new species

Shell small, white, polished, anteriorly attenuated, with a blunt apex and about four and a half whorls, the aperture nearly as long as the shell; suture obscure, overlaid with enamel; aperture narrow, outer lip heavily thickened, with about 16 crenulations, varicose, with a marked channel behind it; there is no spiral sculpture; axial sculpture of more or less obvious incremental lines; body thinly glazed, with four subequal plaits, the anterior evenly rounded about a shallow

sulcus, to the outer lip. Length of shell, 8.5; greatest diameter near the posterior fourth, 5.5 mm. U. S. Nat. Mus. Cat. No. 107973.

Off Fernandina, numerous specimens.

**MARGINELLA CANILLA, new species**

Shell small, white, anteriorly attenuated, of about four whorls, the apex blunt, the suture appressed and only very slightly glazed over; spire short, the periphery of the last whorl quite posterior; aperture narrow, hardly wider in front; outer lip thickened, obscurely crenulate with a groove behind it, receding behind and in front; inner lip with four subequal and a posterior very feeble plait, the anterior edge of the pillar counted as a plait; canal deep, very short, with a thickened margin continuous with the outer lip. Length of shell, 10; of aperture, 8.5; diameter, 4.5 mm. U. S. Nat. Mus. Cat. No. 108329.

Off Georgia and Fernandina, numerous specimens.

Viewed from above this species closely resembles *M. fernandinae* but from the opposite side it is seen to be narrower at the shoulder, with a higher spire, an additional plait, and less distinct denticulation of the outer lip.

**MARGINELLA OCELLA, new species**

Shell small, short, stout, translucent white, with a very short spire of about three and a half whorls, smoothly overglazed; axial sculpture of obsolescent incremental lines, surface polished; there is no spiral sculpture; aperture nearly as long as the shell, narrow, the outer lip nearly straight, thickened but not varicose nor crenulate; body and pillar not enamelled, bearing four subequal plaits, the anterior rounding evenly about a rather deep sinus to the outer lip; axis impervious. Length, 5.5; diameter, 3.5 mm. U. S. Nat. Mus. Cat. No. 107977.

Off Fernandina, abundant.

**MARGINELLA TANORA, new species**

Shell minute, translucent white, blunt-tipped, with about three and a half whorls; suture distinct, narrowly appressed, and constricted, the anterior edge minutely axially wrinkled; whorls moderately convex, the spire not covered with a glaze; surface smooth, with faint obsolescent incremental lines; aperture more than half the length of the shell; outer lip slightly thickened, simple; inner lip with a thin glaze, pillar short with four subequal thin plaits, including the prominent anterior edge of the pillar. Length, 3.7; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 108331.

Off Georgia, 25 specimens.

**MARGINELLA INCESSA, new species**

Shell small, cone shaped, polished, creamy white, with a very blunt apex and about four and a half whorls; suture obscure, appressed,

shallow, with an overglaze; whorls slightly convex; aperture ample, outer lip smooth, thin, not sharp edged, nearly straight, not varicose; pillar and border with a wash of enamel, the former with four subequal thin plaits, the anterior rounding into the outer lip with a very shallow sulcus. Length of shell, 5; of aperture, 4; diameter, 3.5 mm. U. S. Nat. Mus. Cat. No. 107976.

Off Fernandina, numerous specimens.

This is similar to *M. tanora* but larger, slightly more slender, more delicate, and with a less heavy outer lip.

**MARGINELLA INEPTA, new species**

Shell small, thin, subcylindric, white, polished; the apex bluntly rounded-conical, of three whorls; aperture nearly as long as the shell, ample, the outer lip slightly thickened, simple, nearly straight; a narrow sinus behind, hardly any in front, the short pillar with three subequal plaits. Length of shell, 7; of aperture, 6; diameter, 4 mm. U. S. Nat. Mus. Cat. No. 107974.

Off Georgia and Fernandina, not rare.

**MARGINELLA IMMITATOR, new species**

Shell minute, biconic, blunt, white, with about three and a half polished whorls; suture minutely appressed, not glazed over; aperture more than half as long as the shell, rather wide, outer lip thickened, varicose, receding behind and before, not crenulate; pillar with four subequal plaits including that on its anterior edge which rounds evenly into the outer lip. Length of shell 2.6; of aperture, 1.6; diameter, 1.6 mm. U. S. Nat. Mus. Cat. No. 108332.

Off Georgia, one specimen.

Much smaller, but like *M. incessa* in form.

**MARGINELLA MICROGONIA, Dall**

*Marginella microgonia* DALL, Bull. U. S. Nat. Mus. No. 37, 1889, p. 108 (name only).

Shell minute, short, stout, white, with a low spire covered by an overglaze, the aperture shorter than the shell, subequally wide throughout its length, the outer lip smooth with no groove behind it, the pillar with four plaits; surface smooth except at the shoulder which carries 10 to 15 minute axial riblets. Length, 3; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 107975.

Off Georgia and Fernandina, abundant.

The diagnosis of this species was inadvertently overlooked in 1889.

**MARGINELLA ESTHER, new species**

Shell small, elongate-ovate, polished, white, thin, with nearly four whorls and a very blunt apex; suture appressed, not deep, not glazed over; whorls only moderately convex; aperture ample, outer lip thin,



not sharp, inner lip with a wash of enamel, pillar with four subequal thin plaits, the anterior end rounding evenly into the outer lip, with a rather deep anterior sinus. Length of shell, 5; of aperture, 3; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 107978.

Off Fernandina, many specimens.

This has much the form of Conrad's *M. denticulata* (a preoccupied name subsequently replaced by *eburneola* Conrad) but only two-thirds the size, and with a blunter apex, while the outer lip is without denticulation.

#### Genus HYALINA Schumacher

##### HYALINA STYRIA Dall

*Marginella styria* DALL, Bull. Mus. Comp. Zoöl., vol. 18, p. 140, 1889; Trans. Wagner Inst., vol. 3, p. 54, pl. 5, fig. 1, 1890.

Shell small, smooth, polished, white, with a blunt apex and about four whorls; the suture appressed and overglazed smoothly; general form elongate-oval; aperture narrow, widest in front; outer lip straight, slightly thickened, inner lip with four nearly equal plaits counting the thickened edge of the end of the pillar, axis more or less pervious in different specimens. Length of shell, 7; of aperture, 4.5; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 107981.

Off Georgia and Fernandina, very abundant. Off Sombrero, U. S. S. Blake.

##### HYALINA STYRIA (variety) MINOR Dall

Shell small, smooth, polished, white, with a blunt apex and about four whorls; suture appressed and smoothly glazed over; the spire pointed with a small blunt nucleus; aperture narrow, slightly wider in front; outer lip narrow, straight, bent in, in front of a slight varix, pillar short, with three nearly equal plaits including the thickened anterior edge of the pillar; axis imperforate. Length of shell, 6; of aperture, 4; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 107982.

Off Fernandina, numerous specimens.

Although very similar to the species regarded as *M. styria* s. s., these are uniformly smaller and very uniform in character.

##### HYALINA TORTICULA ELUSIVA (new variety)

Shell small, slender, elongate, smooth, polished, yellowish white, with a blunt apex and about four whorls; suture appressed and smoothly glazed over; aperture narrow; the outer lip slightly thickened but without a varix, the middle part moderately arcuately produced; the pillar with four equal plaits, counting the thickened anterior edge; axis impervious. Length of shell, 10; of aperture, 6; diameter, 4 mm. U. S. Nat. Mus. Cat. No. 107980.

Off Fernandina, many specimens.

These specimens differ from typical *torticula* in being smaller, apparently more slender, and having the torsion much less evident, but there seems to be some intergradation.

HYALINA (variety?) AVENELLA Dall

*Marginella (avena variety?) avenella* DALL, Bull. Mus. Comp. Zool., vol. 9, p. 73, 1881.

*Marginella succinea* (Conrad) DALL, Bull. Mus. Comp. Zool., vol. 18, p. 189, pl. 19, fig. 6, 1889.

Off Fernandina, three immature specimens. Also at various Antillean stations in 125 to 805 fathoms, and off Cape Antonio, in 1,002 fathoms. Temperatures from 40° to 50° F. when recorded. U. S. Nat. Mus. Cat. No. 107979.

Nothing is more puzzling, when it comes to differentiating species from their shells alone, than these forms of *Hyalina*. How to weigh differences (apparently constant) of size, is a problem. In the absence of color or sculpture, the best conclusion must be tentative.

In view of the fact that Conrad's figures, though showing little finish, are usually characteristic, I am inclined to believe that the alleged type of the Academy of Sciences is not the original, as the figure represents a much stouter, shorter, and, so to speak, more normal *Marginella*. So I am disposed to resume my name for the slender, pure white, elongate abyssal species.

Genus CYPRAEOLINA Cerulli-Irelli

CYPRAEOLINA HADRIA Dall

*Marginella (Volutella) hadria* DALL, Bull. U. S. Nat. Mus. No. 37, p. 108, 1889.

Shell minute, involved, of an exact egg-oval form, white, polished; aperture narrow, slightly wider in front; outer lip thickened but with no groove behind it; pillar with a thin coating of enamel, pillar short with two prominent and two much less conspicuous plaits; body smooth. Length, 2.6; diameter, 2.8 mm. U. S. Nat. Mus. Cat. No. 107984.

Off Georgia, eighteen, and off Fernandina, one specimen. Cedar Keys, Florida, Hemphill; Charlotte Harbor, Dall; Chesapeake Bay, Bahamas, and various Cuban localities; Henderson.

This is more globose and larger than *C. lachrimula* Gould.

CYPRAEOLINA TINOLIA, new species

Shell minute, ovate, involved, translucent white, smooth and polished, the anterior end a little attenuated; the aperture as long as the shell; outer lip thickened, slightly varicose, not crenulate; the lines of growth are extremely faint and there is no other sculpture; pillar very short with two large and two closely adjacent very minute plaits. Length, 3; diameter, 1.7 mm. U. S. Nat. Mus. Cat. No. 107983.

Off Fernandina.

Some of the specimens are more attenuated than others, but all are more elongated and narrow than *C. hadria*. There is also more of an excavation (not a groove) behind the thickened outer lip than in that species.

**CYPRÆOLINA TRUNCATA, new species**

Shell minute, translucent white, polished, the aperture rather wide, as long as the shell; spire involved, squarely truncate, the body of the shell more or less cylindrical, attenuated in front; outer lip straight, edentulous, moderately thickened; pillar with two strong and usually two very minute plaits behind the others, though at some stages of growth these last may be missing; the anterior edge of the pillar is twisted and merged into the outer lip with quite a marked depression behind it. Length, 2.3; diameter, 1.3 mm. U. S. Nat. Mus. Cat. No. 108336.

Off Georgia and Fernandina, one specimen each.

This is a remarkably distinct species.

**Family VOLUTIDAE**

**Genus AURINIA Adams**

**AURINIA GOULDIANA Dall**

*Voluta gouldiana* DALL, Conch. Exchange, vol. 2, p. 10, July, 1887.

*Aurinia gouldiana* DALL, Bull. Mus. Comp. Zool., vol. 18, p. 154, pl. 29, fig. 3, 1889; Trans. Wagner Inst., vol. 3, p. 81, pl. 7, fig. 2, 1890.

Off Georgia and Fernandina; also from off North Carolina to Key West, in 159 to 509 fathoms, bottom temperature, 45.2° to 48.3° F., living.

A fragment of this interesting species in which the reddish spiral bands are broken into squarish spots, was dredged in 50 fathoms off Key West, but was probably brought into shallow water by a fish.

**Family MITRIDAE**

**Genus MITRA Martyn**

**MITRA STYLIOLA, new species**

Shell small (immature), white, fusiform, with a translucent yellowish, smooth, polished nucleus of a whorl and a half and five or more subsequent whorls; suture distinct, hardly appressed; whorls flattish behind; axial sculpture of (on the last whorl about 20) vertical rounded ribs, crossing the whorls, with narrower or equal interspaces, but obsolete on the base; incremental lines obscure; spiral sculpture of numerous (on the last whorl about 23) equal and equally distributed even threads, with wider interspaces, hardly swollen at the

intersections with the ribs and a little closer set on the canal; there is a small constriction dividing the first three threads in front of the suture from those succeeding them; aperture sublunate, outer lip thin (not mature), body erased, pillar with three plaits, canal straight, as long as the aperture; axis not pervious. Length of shell 11; of aperture and canal, 6; diameter, 5.5 mm. U. S. Nat. Mus. Cat. No. 108440.

Off Georgia and Fernandina, not rare.

Near to *M. styria* Dall, but has more sharply cut ribs and the sculpture is not so regularly reticulate.

**MITRA ZILPHA, new species**

Shell small, dull white, fusiform, with a large smooth white nucleus of a whorl and a half and three and a half subsequent whorls; suture distinct, whorls moderately rounded, sometimes with a shoulder in front of the suture; axial sculpture of a variable number of rounded strong ribs (14 to 21 on the last whorl) with interspaces wider or narrower in conformity with the number of ribs, extending over the whorls but obsolete near the canal; spiral sculpture of fine threads, three or four on the penultimate and 10 or more on the last whorl, with wider interspaces, overrunning but not nodulating the ribs; aperture semilunate, narrow, outer lip thin, smooth within, the body smooth, the pillar straight, with two rather strong oblique plaits; canal produced, axis minutely pervious. Length of shell, 6; of aperture and canal, 3; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 107971.

Off Georgia and Fernandina, 16 specimens.

**MITRA HENDERSONI, new species**

Shell small, of about seven whorls exclusive of about three small smooth brownish nuclear whorls, color whitish with a brownish base darker near the periphery, which appears as a narrow brown band just behind the suture on the spire; axial sculpture of (on the last whorl about 10) rather sharp, nearly vertical ribs with wider interspaces, obsolete near the canal; spiral sculpture of (on the penultimate whorl about eight) rather feeble flattish threads stronger and more widely spaced toward the canal from which they are separated by a distinct sulcus; the canal carries two or three much stronger spiral threads; the periostracum is pale and fibrous; the suture distinct but not deep; aperture narrow, the outer lip sharp, lirate internally, the pillar with three plaits, the canal moderately differentiated, slightly recurved. Length of shell, 17; of last whorl, 10; max. diameter, 6 mm. U. S. Nat. Mus. Cat. No. 333435.

Off Georgia, one specimen with hermit crab.

This would seem to be a relatively shallow-water species, obtained in considerable numbers in the region of the Florida Keys and the Antilles by the late John B. Henderson, jr., in whose honor it is named.

**MITRA GRAMMATULA, new species**

Shell small, short fusiform, of about five whorls with a minute smooth nucleus of a whorl and a half; color pale brown, darker in the spiral interspaces which show in the throat as dark lines; suture minutely channeled; spiral sculpture of (on the penultimate whorl three, on the last whorl about a dozen) strong squarish cords with narrower interspaces, growing smaller toward the canal and covering the entire whorl; the cord in front of the suture is separated by a somewhat wider and deeper interspace from those in front of it; axial sculpture of numerous equal regular narrow sulci, cutting the stronger spirals into squarish nodules but less evident on the base; aperture narrow, pillar with two rather obscure plaits; canal hardly differentiated. Length, 4.5; diameter, 2.3 mm. U. S. Nat. Mus. Cat. No. 333456.

Off Georgia, two specimens.

This verges toward *Mitromorpha*.

**MITRA WANDOËNSIS Holmes**

*Volutmitra wandoënsis* HOLMES, Postpliocene foss. S. Car., p. 57, pl. 10, figs. 10, 10a., 1860.

*Mitra rushii* DALL, Conch. Exchange, vol. 2, p. 9, 1887.

Off Georgia, two specimens. From Cape Hatteras to the Gulf of Mexico, in 12 to 60 fathoms; United States Fish Commission.

**Genus MITROMORPHA A. Adams**

**MITROMORPHA BIPPLICATA Dall**

*Mitromorpha biplicata* DALL, Bull. Mus. Comp. Zool., vol. 18, p. 165, pl. 35, fig. 1, 1889.

Off Fernandina, three specimens.

**MITROMORPHA UNDULATA, new species**

Shell small, white, of about five whorls, including one rather large smooth nuclear whorl; suture undulate, appressed; spiral sculpture of (on the penultimate whorl four, on the last whorl about a dozen) prominent equal cords, slightly swollen where they cross the ribs, the posterior cord somewhat more widely separated from the rest; axial sculpture of (on the penultimate whorl nine) rounded ribs with equal or wider interspaces, crossing the whorls but becoming obsolete toward the end of the last whorl; aperture narrow, outer lip sharp, lirate within; pillar with two well-marked pustulations, canal short, slender, slightly recurved. Length, 7.5; length of last whorl, 5; diameter, 4 mm. U. S. Nat. Mus. Cat. No. 107995.

Off Fernandina, one specimen.

This is one of those forms which it is questionable whether to place it in *Mitra* or *Mitromorpha*.

### Family FASCIOLARIDAE

#### Genus FASCIOLARIA Lamarck

##### FASCIOLARIA, species

A fragment was obtained off Georgia which included part of the last whorl and canal of what appears to be a small species of *Fasciolaria*. The suture is minutely channeled, there are seven obsolete knoblike axial ribs chiefly confined to the periphery, behind which the whorl is slightly constricted. The minor sculpture comprises numerous fine spiral threads in front of the suture minutely reticulated by prominent incremental lines giving a minutely punctate appearance. The canal is long, with three threadlike fine plaits on the pillar. The fragment measures about 12.5 mm. in length. U. S. Nat. Mus. Cat. No. 347843.

The species is doubtless new, but can not be adequately described from the imperfect specimen.

#### Genus FUSINUS Rafinesque

##### ? FUSINUS SCHRAMMI Crosse

*Fusus schrammi* CROSSE, Journ. de Conchyl., vol. 13, p. 31, pl. 1, fig. 9, 1865.

Off Georgia and Fernandina, five very young specimens which may be immature individuals of the species described by Crosse from Guadelupe.

##### FUSINUS BULLATUS, new species

Shell small (possibly immature), pale gray, of about three whorls, exclusive of the large, swollen, smooth, white nucleus of nearly two whorls; spiral sculpture of a prominent undulated keel at the periphery with a smaller simple cord in front of it, the interval and the rest of the whorl behind the keel very finely closely threaded; on the base there are about eight stronger threads with wider interspaces, sometimes with an intercalary fine threadlet; there are no developed ribs, except as indicated by the dozen prominent nodes on the peripheral keel, yet in older specimens they may develop; the suture is closely appressed; the aperture is subovate, not lirate within and with the outer lip not thickened; the pillar is smooth, gyrate, and the axis pervious; the canal is slender, moderately long and slightly curved. Length, 10; length of last whorl, 5; diameter, 4 mm. U. S. Nat. Mus. Cat., No. 107998.

Off Fernandina, one specimen.

##### FUSINUS VITREUS, new species

Shell small, white, thin, with an inflated smooth, white nucleus of two whorls and three and a half subsequent whorls; suture distinct,

more or less undulated by the sculpture; axial sculpture of (on the last whorl 10 or 11) well-marked rounded ribs with equal or wider interspaces, crossing the whorls on the spire, obsolete on the base, and very fine silky incremental lines; spiral sculpture of (on the spire two) cords near the periphery and one close to or hidden by the succeeding suture; these become prominent on the periphery of the last whorl and nodulose where they cross the ribs; in front of them the base and canal are sculptured with very fine close spiral threads; aperture moderate, outer lip simple, body with a thin wash of enamel; canal well developed, flexuous; axis minutely pervious. Length of shell, 9.5; of aperture and canal, 4.5; diameter, 5 mm. U. S. Nat. Mus. Cat. No. 108317.

Off Georgia, numerous specimens.

### Family CHRYSODOMIDAE

#### Genus CHRYSODOMUS Swainson

##### Subgenus SIPHONORBIS Mörch

##### SIPHONORBIS FERMINUTUS, new species

Shell small (immature?), stout, white, with a planorboid white nucleus of one and a half whorls, and three and a half subsequent well-rounded, rapidly increasing whorls; suture distinct, not deep; axial sculpture of rather obvious fine close incremental lines which minutely crenulate the spiral; spiral sculpture of (on the penultimate whorl half a dozen) fine spiral threads with wider interspaces which on the last whorl grow closer and coarser anteriorly, covering the whole whorl; aperture ovate, outer lip thin, body erased, pillar attenuated in front, canal slender, narrower anteriorly. Length of shell, 9; of aperture and canal, 6.5; diameter, 5 mm. U. S. Nat. Mus. Cat. No. 107996.

Off Georgia and Fernandina, not rare.

The nucleus begins smoothly, quickly develops faint spirals, these gradually increase in strength and merge into the spirals of the adult sculpture; the nucleus of *S. ebur* Mörch, type of the subgenus, is very similar. Most of the specimens obtained were immature and it is not certain that that largest specimen, on which the diagnosis is based, is fully adult.

### Family COLUMBELLIDAE

#### Genus ASTYRIS H. and A. Adams

##### ASTYRIS PURA Verrill

*Astyris pura* VERRILL, Trans. Conn. Acad., vol. 5, pt. 2, p. 515, June, 1882.—  
BUSH, Bull. Mus. Comp. Zool., vol. 23, p. 240, pl. 1, fig. 13, 1893.

Off Fernandina, 14 specimens. Off the eastern coast of the United States from Cape Cod to Florida, in 70 to 484 fathoms; United States Fish Commission.

## ASTYRIS PERLUCIDA, new species

Shell minute, slender, white or yellowish, thin, with an inflated smooth nucleus of a whorl and a half and about three subsequent whorls; suture distinct, not appressed; whorls moderately rounded, smooth except for very fine regular incremental lines only visible with a lens; there are very faint spiral striae on the base and back of the canal; aperture sublunate, outer lip thin, simple, body enameled, pillar straight, canal distinct, slightly recurved; axis minutely or not at all perrivous. Length of shell, 5; of aperture, 2; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 108001.

Off Fernandina, about 20 specimens.

Similar to *A. pura* but with rounder, thinner, and more translucent whorls, and somewhat more elevated spire.

## ASTYRIS STEMMA, new species

Shell small, slender, white, with a small blunt white nucleus of about one whorl and five subsequent rather flattish whorls; suture distinct, not deep; axial sculpture of obscure incremental lines; there is no spiral sculpture; in front of the suture the edge of the succeeding whorl is very slightly and narrowly turrited; the base is gradually attenuated; aperture short, semilunate; the outer lip thin, smooth, nearly vertical; the body without glaze, the pillar short and twisted; the axis minutely perrivous. Length of shell, 6; of aperture, 2; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 108003.

Off Fernandina, abundant.

This is more elongated than either of the others.

## Section FLUELLA Dall

Like *Astyris* but spirally sculptured without conspicuous axial sculpture.

## ASTYRIS (FLUELLA) VIDUA Dall

*Astyris (Fluella) vidua* DALL, Proc. Biol. Soc. Wash., vol. 37, p. 87, 1924.

Shell small, thin, translucent white, with an inflated, smooth nucleus of a whorl and a half, and about three subsequent well-rounded whorls; suture distinct, not appressed; axial sculpture only of faint incremental lines; spiral sculpture of numerous equal and equally spaced spiral striae covering the whole shell but stronger on the last whorl; aperture semilunate, outer lip thin, simple, a slight swelling behind it; body with a thin layer of enamel; pillar short, slightly recurved; canal hardly differentiated from the aperture, axis perrivous. Length of shell, 4; of aperture, 1.7; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 108002.

Off Fernandina, abundant.

This may be taken as the type of the new section.



Tryon placed shells like these with *Seminella*, but the solid bright colored tropical shells which are typical of that genus can hardly be closely associated with the present group.

ASTYRIS (FLUELLA) AMPHISSELLA Dall

*Columbella* (*Astyris*?) *amphissella* DALL, Bull. Mus. Comp. Zool., vol. 9, p. 91, 1881; vol. 18, p. 188, pl. 19, fig. 10 e, 1889.

Shell minute, thin, white, with an inflated smooth nucleus of one and three subsequent whorls; suture distinct, not deep, whorls well rounded; spiral sculpture variable, obsolete on some specimens and quite evident on others, composed of very fine equal spiral striae; axial sculpture also variable in strength, when best developed (as in the specimen selected as type), there are on the last whorl about 24 fine sharp slightly flexous riblets, obsolete beyond the periphery, with narrower interspaces; aperture subovate, outer lip slightly thickened, simple; body with a coat of enamel; pillar short, canal short but sharply recurved. Length of shell, 4.5; of aperture, 2.5; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 108323.

Off Georgia, abundant.

ASTYRIS (FLUELLA), variety RUSHII Dall.

*Anachis amphissella*, variety *rushii* DALL, Bull. Mus. Comp., Zool. vol. 18, p. 188, 1889.

Off Georgia, numerous, with the type. Off Fowey Rocks, in 465 fathoms; Dr. W. H. Rush.

ASTYRIS (FLUELLA) ENIDA, new species

Shell small, thin, white, with an inflated translucent nucleus of a whorl and a half and about four subsequent moderately shouldered, well-rounded whorls; suture distinct, not appressed; axial sculpture of few, irregularly distributed, thin sharp low lamellae, crossing the whorls and more or less obvious incremental lines; spiral sculpture covering the shell, of fine equal, and mostly equally spaced, threads with usually narrower interspaces; aperture ovate, body and pillar with a thin coat of enamel; outer lip thin, simple, not varicose; canal short, recurved; axis pervious. Length of shell, 6; of aperture, 2.7; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 108324.

Off Georgia and Fernandina, common.

The periostracum is pale, fibrous, and usually dehiscent.

ASTYRIS (FLUELLA) APPRESSA, new species

Shell, small, short, stout, white, with an inflated blunt nucleus of a whorl and a half and about three subsequent whorls; suture distinct, not appressed; spiral sculpture of fine close equal even and evenly distributed threads covering the whole shell; axial sculpture of a few irregularly distributed obscure ridges most obvious on the

spire, and very fine close well-marked incremental lines; aperture narrow, outer lip varicose with five or six denticles within, body with a thick coat of enamel, pillar short, canal very short, but recurved. Length of shell, 6; of aperture, 3; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 108326.

Off Georgia and Fernandina, nine specimens.

The prominent characteristic of the typical shell is the way the rotundity of the whorls is suppressed so as to indicate a smooth spindle shape for the whole shell.

A variety? (333458) from the same station is more slender, and has the upper whorls nearly smooth and the threads on the last whorl coarser and the varix less prominent.

### Section PLECTARIA Dall 1924

Like *Astyris* but with predominant axial sculpture.

#### ASTYRIS (PLECTARIA) CRUMENA Dall

*Astyris (Plectaria) crumena* DALL, Proc. Biol. Soc. Wash., vol. 37. p. 87, 1924.

Shell short, small, stout, white, with an inflated translucent nucleus of a whorl and a half and about three subsequent whorls; suture distinct, not deep, whorls well rounded, rapidly increasing; axial sculpture of (on the last whorl about 14) rounded ribs, crossing the whorl, with wider interspaces; spiral sculpture of numerous fine equal threads equally distributed over the whole whorl and not nodulous where they cross over the ribs; aperture ovate, outer lip simple, varicose; body with a wash of enamel, pillar short, canal wide and short, not recurved; axis minutely pervious. Length of shell, 4; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 108006.

Off Fernandina, three specimens.

These shells on account of their axial sculpture were formerly referred to *Anachis* the type of which is *Columbella scalarina* Sowerby, which obviously can not be associated with shells of the present group, of which the above species may be taken as type. They are clearly related closely to *Astyris*, of which the type is *C. rosacea* Gould.

#### ASTYRIS (PLECTARIA) EMBUSA, new species

Shell small, stout, white, with a large smooth polished nucleus of a whorl and a half, and about four subsequent whorls; suture deep, not appressed, whorls very rotund; axial sculpture of (on the last whorl about a dozen) strong narrow rounded ribs with wider interspaces, crossing the whorls; spiral sculpture of numerous equal and equally distributed fine threads with narrower interspaces, not swollen where they pass over the ribs, and visible over the whole shell; last whorl much the largest; aperture rather short and wide, a glaze

on the body, the outer lip simple, not internally lirate and mostly sharp-edged; pillar with a coat of enamel in adults, short, smooth; canal short, slightly recurved. Length of shell, 4.5; of last whorl, 2.5; diameter, 2.4 mm. U. S. Nat. Mus. Cat. No. 108322.

Off Georgia, very abundant.

**ASTYRIS (PLECTARIA) EURIBIA, new species**

Shell minute, subfusiform, white, extremely variable, with a smooth blunt nucleus of a whorl and a half and somewhat less than three subsequent whorls; suture distinct, not appressed; whorls rounded; axial sculpture of slightly flexuous narrow riblets, usually with wider interspaces, varying from none at all to 24 on the last whorl, crossed by numerous fine spiral threads, equal and closely spaced over the whole shell, strong in some specimens, obsolete and barely perceptible in others, not anywhere nodulous; aperture subovate, outer lip nearly straight, hardly thickened, smooth within; body with a thin layer of enamel; pillar short, canal very short, axis pervious. Length of shell, 4; of aperture, 2; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 108205.

Off Fernandina, abundant.

The ribs are threadlike, sometimes almost like elevated lines and sometimes hardly more prominent than incremental lines, while the spiral sculpture is very feeble and sometimes hardly perceptible.

**ASTYRIS (PLECTARIA) PROJECTA, new species**

Shell small, slender, white, with a blunt smooth inflated nucleus of a whorl and a half and about four and a half subsequent slightly shouldered whorls; suture distinct, not deep, narrowly appressed; early whorls with about 14 feeble, irregular, narrow riblets crossing the whorls, with wider interspaces, growing feebler with the growth of the shell and obsolete or absent (in the type specimen) on the last whorl; incremental lines feeble; spiral sculpture only of a few obsolete lines on the back of the canal; aperture subovate, body erased, outer lip thin, simple, pillar short, twisted, canal hardly differentiated from the aperture; axis impervious. Length of shell, 6; of aperture, 1.6; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 108004.

Off Fernandina, one specimen.

**ASTYRIS (PLECTARIA) ALBELLA C. B. Adams**

*Pleurotoma albella* C. B. ADAMS, Contr. Coneh., vol. 1, p. 63, 1850.

*Anachis acuta* STEARNS, Tryon Man., vol. 5, p. 158, pl. 55, fig. 66, 1883.

Shell small, elongated, slender, white, with a smooth blunt inflated nucleus of a whorl and a half and about four and a half rather flat-sided subsequent whorls; suture distinct, not deep; axial sculpture of (on the penultimate whorl about 14) vertical rounded ribs, crossing the whorls on the spire, with subequal interspaces; on the last

whorl fainter and obsolete beyond the periphery, the incremental lines faint; spiral sculpture confined to the canal, of fine close threads; aperture narrow, outer lip thin, with a slight thickening behind it, smooth inside; pillar nearly straight; canal well defined; axis minutely pervious. Length of shell, 8; of aperture 2.5; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 108007.

Off Fernandina, numerous.

This is quite close to *C. verrilli* Dall, and may prove identical; one specimen shows brownish obscure color marks, but these may be accidental.

ASTYRIS (PLECTARIA), sp. indet

A species of *Astyris*, too dilapidated to identify specifically, was collected off Georgia (No. 108325) and there are similar specimens in the collection dredged off Fowey Rocks, Florida Strait, in 209 fathoms, by the late John B. Henderson, jr.

Section PARASAGENA Dall, 1924

Shells resembling *Astyris*, but with a sharply cut, open reticular sculpture.

Type.—*Astyris* (*Parasagena*) *georgiana* Dall.

ASTYRIS (PARASAGENA) GEORGIANA Dall

*Astyris* (*Parasagena*) *georgiana* DALL, Proc. Biol. Soc. Wash., vol. 37, p. 87, 1924.

Shell small, translucent white, biconic, with a smooth white inflated nucleus of a whorl and a half, and about four subsequent moderately convex whorls; suture distinct, not appressed, with an elevated thread on its anterior margin; axial sculpture of (on the last whorl 12 to 14) narrow vertical rounded ribs with wider interspaces, crossing the whorls, and rather conspicuous incremental lines; spiral sculpture of (on the spire two, on the last whorl about nine) very distinct equal fine threads, over running the ribs without nodulation, with wider interspaces, more close on the base, and fine intercalary striae, chiefly visible in the interspaces and there minutely reticulating the incremental lines; aperture rather narrow, the outer lip hardly thickened except when coincident with a rib, smooth inside; the body and pillar short, the canal hardly differentiated from the aperture. Length of shell, 5; of aperture, 2.5; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 108311.

Off Georgia, many specimens.

This species has a vitreous appearance and the wide shallow reticulation is notable.

ASTYRIS (PARASAGENA) SAGENATA, new species

Shell small, whitish, with a smooth nucleus of one and a half whorls and about three or four and a half subsequent whorls; suture

distinct, undulate, with a space on each side between it and the nearest spiral cord; spiral sculpture of (on the penultimate whorl 5, on the last whorl about 14) equal and equally distributed small cords with much wider interspaces, little swollen where they cross the ribs, and covering the whole shell; axial sculpture of (on the last whorl about 11) rounded narrow ribs with much wider interspaces, crossing the whole whorl, and in the interspaces conspicuous fine incremental lines; aperture rather wide, outer lip sharp with 4 or 5 small pustular denticulations well within the margin; pillar smooth, slightly concave, canal short, a little recurved. Length of shell, 6; of last whorl, 4; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 108312.

Off Georgia, 16 specimens.

The specimens obtained have been discolored by their stay on the bottom and are of a brownish color like many of the other specimens obtained from these two localities.

#### Section ATILIA H. and A. Adams

##### COLUMBELLA (ATILIA?) MYSTICA, new species

Shell small, slender, solid, pale brown (faded ?) with a smooth nuclear whorl and a half, and four and a half subsequent whorls; suture distinct, whorls well rounded; spiral sculpture of (on the spire two, on the last whorl four) prominent cords near the periphery with wider interspaces, and smaller close set threads on the base and in front of the suture; axial sculpture of (on the last whorl about a dozen) rather feeble rounded ribs with narrower interspaces, these extend more or less obviously over the whorl; aperture ovate; outer lip thin, denticulate within, inner lip smooth, canal short, strongly spirally threaded, slightly recurved. Length, 4.3; diameter, 1.5 mm. U. S. Nat. Mus. Cat. No. 108321.

Off Georgia, one specimen.

*Aesopus filiosus* Angas (= *Columbella plurisulcata* Reeve) from Port Jackson, Australia, is somewhat such a shell as this, and is referred by Tryon to *Atilia*. But if *C. suffusa* as indicated by Pace is the type of *Atilia*, the present species can hardly be referred to the same group. Without more material and investigation of what the Australian shell involves, I hesitate to give a new sectional name.

#### Family MURICIDAE

##### Genus PTEROPURPURA Jousseaume

##### PTEROPURPURA TRISTICHA Dall

*Pteronotus tristichus* DALL, Bull. Mus. Comp. Zool., vol. 18, p. 202, pl. 15, fig. 3, 1889.

Off Georgia and Fernandina, one well grown and many young shells. Off Cuba in 152 to 450 fathoms, U. S. S. *Blake*.

## Genus UROSALPINX Stimpson

There is a group of small deep water shells referred by Verrill to this genus, to which they bear a certain resemblance, but of which the dentition and other anatomical characters are as yet unknown. To this belong *U. carolinensis* and *U. macra* Verrill, and apparently the following species. I confess to doubt as to their proper place and whether they really belong to the genus typified by *U. cinereus* Say, but in advance of further information it seems best to leave them, tentatively, where Verrill placed them.

## ? UROSALPINX VERRILLI, new species

Shell small, white, fusiform, with a smooth white nucleus of about one smooth small whorl followed by a second minutely reticulate whorl, on which the spiral threads are stronger, increasing in strength to the end of the nuclear portion, and three subsequent well rounded whorls; suture distinct and deep, not appressed; axial sculpture of (on the last whorl about 15) narrow rounded ribs crossing the whorls, with wider interspaces; the incremental lines are fine even, closely adjacent, and of a silky texture; the ribs are obsolete on the base of the last whorl; spiral sculpture of (on the penultimate whorl 6; on the last whorl 11) equal and equally spaced rounded cords with subequal interspaces (in which occasionally some fine spiral striae occur) and 10 or more close-set simple cords on the base; the former are slightly swollen at their intersections with the ribs; aperture semi-lunate, the outer lip thin, smooth internally, the body erased, the pillar short, twisted, the canal short and recurved; the axis impervious. Length of shell, 9; of aperture, 4.5; diameter, 4.5 mm. U. S. Nat. Mus. Cat. No. 108319.

Off Georgia, abundant.

## ? UROSALPINX STIMPSONI, new species

Shell small, fusiform, white, with an inflated, smooth white nucleus of a whorl and a half and nearly four subsequent whorls; suture distinct, rather deep, whorls well rounded; early whorls more or less distinctly ribbed with about 16 rounded ribs on the penultimate whorl, obsolete on the last whorl, with more or less obvious close incremental lines; spiral sculpture of (on the penultimate whorl 6; on the last whorl about 20) equal and equally distributed cords with usually wider interspaces in each of which runs a fine intercalary thread; this sculpture covers the whole whorl; aperture sublunate, outer lip thin, sharp, crenulate by the sculpture; body lightly erased, pillar smooth, twisted; canal short, slightly recurved; axis pervious. Length of shell, 10; of aperture and canal, 4.5; diameter, 6 mm. U. S. Nat. Mus. Cat. No. 107999.

Off Georgia and Fernandina, 11 specimens.

**Genus CORALLIOPHILA H. and A. Adams****CORALLIOPHILA LACTUCA Dall**

*Coralliophila lactuca* DALL, Bull. Mus. Comp. Zool., vol. 18, p. 220, pl. 16, fig. 6, 1889.

Off Fernandina, Fla., at station 2669, in 352 fathoms, sand, bottom temperature, 43.7° F. Also off Cuba in the Gulf of Mexico in 152 to 229 fathoms, ooze, bottom temperature, 49.5° F.

This was found so near station 2668 that it seemed proper to include it.

**Subfamily THAISINAE****Genus THAIS Bolten****THAIS FLORIDANA Conrad**

*Purpura floridana* CONRAD, Journ. Acad. Nat. Sci. Phila., ser. 1, vol. 7, p. 265, pl. 20, fig. 21, 1837.

Off Fernandina, one very young dead specimen.

This specimen was evidently due to drift from the shore or disengagement by some fish or bird.

**Family EPITONIIDAE****Genus EPITONIUM Bolten****EPITONIUM MARCOËNSE, new species**

Shell small, white, acute with a translucent nucleus of three and six subsequent rounded adjacent whorls; axial sculpture of (on the last whorl about 22) low thin sharp simple varices with wider interspaces and not continuous over the suture; spiral sculpture of almost microscopic fine striae, uniform over the whorls; base with no disk, aperture nearly circular. Length, 8; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 108017.

Off Fernandina, 10 specimens, mostly young; off Georgia six specimens. Beach at Marco, Fla., common; Olson.

The spiral striation is only visible under a lens in a good light.

**EPITONIUM FRACTUM, new species**

Shell small, decollate, with four well-rounded whorls remaining, with a dull surface, white, and rather laxly coiled; suture distinct, deep; axial sculpture of (on the last whorl 13) thin low slightly oblique sharp lamellae, continuous in the depth of the suture and up the spire, making about one-third of a turn around the shell; there is no spiral sculpture (though the edges of the lamellae look more or less irregular, it may be due to wear); the base is evenly rounded without a disk, and imperforate; aperture rounded with a thin slightly expanded margin. Length of four whorls, 9.5; of aperture, 3; diameter, 4 mm. U. S. Nat. Mus. Cat. No. 108015.

Off Fernandina, one specimen.

## EPITONIUM AZELOTES, new species

Shell small, solid, white, with a minute brown reticulate nucleus of two and a half whorls and about six subsequent well-rounded whorls; suture distinct; axial sculpture of (on the last whorl about 16) strong squarish ribs with equal or narrower interspaces and more or less obvious incremental lines; spiral sculpture of (on the early whorls 2, later 3, and on the last whorl 4) strong cords, which make with the ribs deep reticulations but are not nodulous at the intersections with the ribs; the anterior cord is within the rounded margin of the base, and between it and the axis the surface is nearly smooth and slightly concave; aperture rounded, the outer lip crenulate by the sculpture; the axis is impervious. Length of shell, 4; of aperture, 0.75; diameter, 1.7 mm. U. S. Nat. Mus. Cat. No. 108370.

Off Georgia, one specimen.

This is a very characteristic form, having somewhat the aspect of a *Mathilda*. I have found nothing figured which approaches it.

## EPITONIUM, species

A small, probably immature, shell, white, with a small acute white nucleus of two and a half whorls, and four rapidly enlarging subsequent adjacent whorls with about a dozen solid smooth varices continuous over the suture; spiral sculpture of fine striae perceptible on the earlier whorls, more or less obsolete on the later ones; there is no basal disk and the axis is imperforate. Length, 3.2; diameter, 1.5 mm. U. S. Nat. Mus. Cat. No. 108872.

Off Georgia, one specimen.

In doubt as to whether this may not be the young of a larger species, I refrain from naming it.

## EPITONIUM OPALINUM, new species

Shell small, translucent white, elongated, with a dark-brown, minutely reticulate nucleus of three small whorls and about a dozen subsequent whorls; suture distinct, not impressed, with a single simple thread immediately behind it; axial sculpture of (on the last whorl 17 to 25) narrow rounded vertical ribs crossing the whorls, with wider interspaces, and very minute regular close-set sharp incremental lines; the base shows the feeble ends of the ribs radiating from the axis; spiral sculpture of (on the last whorl 9 or 10) fine equal simple threads, with usually subequal narrower interspaces, not swollen where crossing the ribs at the intersections; at the periphery of the whorl is an angle or small ridge which appears behind the suture on the spire; the base is flattish or even slightly concave without spiral sculpture; aperture subquadrate with thin margin, the axis imperforate. Length of shell, 10.5; of aperture, 1.5; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 108368.

Off Georgia, 13 specimens.

The flattish whorls and shallow suture recall *Opalia*.



**EPITONIUM LAVARATUM, new species**

Shell white with a reticulated brown elongated nucleus of about three whorls and 9 or 10 subsequent whorls; suture deeply constricted, not solute; whorls well and evenly rounded with a large smooth basal disk; axial sculpture of (about 16 on the last whorl) equal rounded ribs with wider interspaces, interspersed on the later whorls with heavier varices; fine incremental lineation also occurs; spiral sculpture of 10 or more threads with wider interspaces and more or less spiral striation; the base is imperforate, the aperture rounded. Length, 10; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 347845.

Off Georgia in large numbers, but mostly worn and discolored.

**EPITONIUM DISCOBOLARIUM Dall**

*Scala (Opalia) discobolaria* DALL, Bull. Mus. Comp. Zool., vol. 18, p. 324, pl. 18, fig. 2, 1889.

Shell small, whitish, acute with eight rather rapidly enlarging whorls exclusive of the (lost) nucleus; suture well marked, somewhat undulate; whorls well rounded, with a brown basal disk the edge of which is usually covered by the suture; axial sculpture of (on the last whorl 14) strong rounded low ribs with wider interspaces, and obvious incremental lines in the interspaces; spiral sculpture of (on the last whorl five or six) sharp narrow grooves, with wider interspaces, which also cut the ribs; on the basal disk there is a relatively smooth border cut by a feeble median stria, inside this border there are five or six spiral grooves pretty close together; the shell is imperforate and the aperture roughly quadrate; the ribs are not continuous up the spire. Length, 7.5; diameter, 3.5 mm. U. S. Nat. Mus. Cat. No. 333461.

Off Fernandina and Georgia, two specimens.

This has a general resemblance to *E. lavaratum* but the sculpture is different and the basal disk not smooth as in that species. The original type of this species was in bad order and the diagnosis of a more perfect specimen is now furnished.

**EPITONIUM CANTUM, new species**

Shell small, slender, whitish, with a brown reticulate acute nucleus of three, and eight subsequent whorls; suture deeply constricted but not solute; whorls inflated; spiral sculpture of (on the last whorl five or six) rounded cords, equally distributed with somewhat wider interspaces, overrunning the ribs and slightly swollen at the intersections; there is a well-marked basal disk the edge of which is covered by the suture, and which carries five or six fine close spiral threads; axial sculpture of (on the last whorl 15) strong rounded ribs, the final rib

or varix larger than the others; base imperforate, aperture rounded. Length, 6.5; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 333464.

Off Georgia, four specimens.

Genus *OPALIA* H. and A. Adams

*OPALIA*, sp. indet.

A fragment of an undescribed *Opalia* was obtained off Fernandina, which showed about 14 strong low rounded varices and fine silky incremental sculpture crossed by 9 or 10 extremely delicate fine spiral threads with much wider interspaces. The height of the whorl is 5 and the diameter 9 mm. U. S. Nat. Mus. Cat. No. 108014.

*OPALIA?* *DROMIO*, new species

Shell small, solid, white, with a brown reticulate three-whorled acute nucleus and eight well rounded subsequent whorls; suture deep, not appressed, not crossed by the axial ribs; axial sculpture of (on the last whorl 17) rather stout rounded ribs with subequal interspaces, not continuous up the spire; spiral sculpture of microscopic faint spiral striae hardly modifying the ribs; basal disk smooth, bordered by a raised line; aperture rounded, axis imperforate. Length of shell, 6; of aperture, 1; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 108018.

Off Fernandina, six specimens

Family MELANELLIDAE

Genus *MELANELLA* Bowdich

*MELANELLA* *CALLISTEMMA*, new species

Shell small, slender, white, flat-sided, with a blunt apex and about ten whorls; suture distinct, appressed; sculpture of faint incremental lines and an occasional varical stria; base rounded, imperforate; aperture subovate, outer lip thin, simple, somewhat patulous, inner lip short. Length of shell, 5.7; of aperture, 1.3; diameter, 1.6 mm. U. S. Nat. Mus. Cat. No. 108035.

Off Fernandina, three specimens.

This is not unlike *M. rectiuscula* Dall, but the latter is larger and has more rounded whorls.

*MELANELLA* *OLEACEA* Kurtz and Stimpson

*Eulima oleacea* KURTZ and STIMPSON, Proc. Boston Soc. Nat. Hist., vol. 4, p. 115, Dec. 1851.—TRYON, Man., vol. 3, p. 273, pl. 69, fig. 36, 1836.

Shell small, straight, conical, translucent white, rarely with pale brownish spiral bands, smooth, polished, with a blunt apex and about a dozen flattish whorls rather rapidly increasing in diameter; suture obscure, over-glazed; base evenly rounded without an umbilical dimple; aperture sublunate, outer lip simple, slightly flexuous, body with

a layer of enamel, inner lip short and heavy. Length of shell, 9.2; of aperture, 2.5; diameter, 3.3 mm. U. S. Nat. Mus. Cat. No. 108375.

Off Georgia, 10 specimens.

The specimen described by Stimpson and figured by Tryon is young; the brownish bands are not constant in fresh specimens and fade in the cabinet. A description is therefore given of the adult shell, which agrees with specimens identified as *M. oleacea* from Vineyard Sound, by Professor Verrill.

**MELANELLA CONOIDEA Kurtz and Stimpson**

*Eulima conoidea* KURTZ, and STIMPSON, Proc. Boston Soc. Nat. Hist., vol. 4, p. 115.—TRYON, Man., vol. 8, p. 273, pl. 69, fig. 40, 1886.

Shell small, solid, polished, white, with a blunt apex, slightly bent spire, and about eleven whorls; suture obscure, with an over-glaze; the whorls enlarge rather rapidly; there is no perceptible sculpture; base evenly rounded; aperture short, sublunate, the outer lip simple, flexuous, the body with a layer of enamel, the inner lip thickened. Length of shell, 9.5; of aperture, 2; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 108026.

Off Fernandina, one specimen; South Carolina, Kurtz.

This is very much like *M. oleacea* but the last whorl is not so much expanded, the sides are flatter, and in the adult the carination of the last whorl mentioned by Stimpson, a feature of immaturity, does not appear.

**MELANELLA PENNA, new species**

Shell small, conical, smooth, polished, creamy white with a blunt apex and eight flattened whorls; suture obscure, appressed, lightly over glazed; surface without sculpture; aperture semilunate, outer lip simple, somewhat flexuous, body with a layer of enamel, inner lip slightly concave, with a perceptible umbilical depression behind it, the base evenly rounded. Length of shell, 5.7; of aperture, 1.5; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 108032.

Off Fernandina, five specimens.

This species appears to be nearly related to *M. gracilis* C. B. Adams, 1850; not of Jeffreys, 1848.

**MELANELLA RECTIUSCULA Dall**

*Eulima (Liostraca) rectiuscula* DALL, Trans. Wagner Inst., vol. 3, p. 160, 1890.

Shell small, slender, polished, white, with a swollen blunt nucleus of two whorls and ten subsequent slightly convex whorls; suture distinct, shallow, not glazed over; sculpture only of faint incremental lines; base elongately rounded, imperforate; aperture subovate, outer lip simple, slightly convexly arcuate, inner lip short, slightly

raised. Length of shell, 7; of aperture, 2; diameter, 1.7 mm. U. S. Nat. Mus. Cat. No. 108033. The type is No. 87343.

Off Fernandina, four specimens.

This was entered in Bulletin 37, U. S. National Museum, under the name of *E. stenostoma*, but later comparisons with Jeffreys' European types showed that the two are distinct.

MELANELLA FERNANDINAE, new species

Shell minute, conic, polished, white, with a small blunt apex and about seven whorls; suture shallow, not glazed over; whorls flattish, base elongately rounded; there is no visible sculpture; aperture subovate, the outer lip thin, simple, slightly produced medially; inner lip short with a slight dimple behind it. Length of shell, 4.3; of aperture, 1.2; diameter, 1.5 mm. U. S. Nat. Mus. Cat. No. 108034.

Off Fernandina, numerous specimens.

MELANELLA CINCA, new species

Shell minute, polished, white, acute-conical, of about eight very slightly convex whorls; suture obscure, glazed over; sculpture of very faint incremental lines; base evenly rounded, imperforate; aperture subovate, short, margins thin, simple, outer lip prominently convexly arcuate. Length of shell, 3.2; of aperture, 0.8; diameter, 1 mm. U. S. Nat. Mus. Cat. No. 108028.

Off Fernandina, five specimens.

MELANELLA ABIDA, new species

Shell small, solid, acute, white, the spire bent slightly to the right, with a minute blunt apex and about 10 whorls; suture obscure, not impressed; whorls flat, glazed over; base somewhat abruptly rounded, imperforate; sculpture absent, aperture ovate, outer lip thin, simple, produced arcuately, inner lip short, anterior margin slightly narrowed in front. Length of shell, 7; of aperture, 1.7; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 108030.

Off Fernandina, seven specimens.

MELANELLA CORRIDA, new species

Shell small, solid, white, with a faint indication of an ill-defined brownish band around the periphery of the later whorls; the spire bent slightly to the right, the 10 whorls flat-sided, the apex minute and blunt; suture obscure, glazed over; sculpture none visible, the last whorl about one-third of the whole length; base elongately rounded, aperture subovate, the margin thin, outer lip simple, medially arcuately produced. Length of shell, 6.5; of aperture, 1.5; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 108376.

Off Georgia, 15 specimens.

**MELANELLA ARCUATA, C. B. Adams**

*Eulima arcuata* C. B. ADAMS, Contr. to Conch., p. 110, 1850 (not of Sowerby, 1866).

Shell minute, white, solid, the apex minute, blunt, the spire irregularly bent, chiefly to the right, with seven or eight flattish whorls; suture obscure, over-glazed; surface polished, without visible sculpture; base elongately rounded, imperforate; aperture narrow, slightly narrowed in front, margins thin, simple, the outer lip very slightly convexly arcuate. Length of shell, 4; of aperture, 1.5; diameter, 1.7 mm. U. S. Nat. Mus. Cat. No. 108029.

Off Fernandina, numerous specimens. Jamaica, West Indies; Adams.

**MELANELLA OPHIODON, new species**

Shell minute, slender, thin, translucent white, the apex minute, blunt, the spire more or less arcuate, in the type bent to the right, with about 8 whorls; suture visible, appressed, over-glazed; surface polished without visible sculpture; aperture very short, somewhat patulous; base rounded, imperforate, the margin of the aperture thin, simple; the outer lip slightly protractively arcuate. Length of shell, 3.5; of aperture, 0.7; diameter, 1 mm. U. S. Nat. Mus. Cat. No. 108027.

Off Fernandina, one specimen.

Not unlike *M. arcuata* but proportionately more slender. In the former it is the early part of the spire which is bent; in the present species the whole shell is evenly arcuate.

**MELANELLA ANACHOREA, new species**

Shell minute, smooth, transparent whitish, thin, the apex slightly brownish, minute and blunt, with about 10 whorls, the spire slightly bent backward; suture appressed, glazed over, the whorls flattish; base rounded, imperforate; aperture narrowly sublunate, the outer lip thin, moderately convexly arcuate, inner lip very short, thin, body without enamel. Length of shell, 5; of aperture, 1.2; diameter 1.5 mm. U. S. Nat. Mus. Cat. No. 108377.

Off Georgia, numerous specimens.

In most Melanellae showing torsion, the spire is bent either to the right or left; in the present one the bending is in the direction opposite to the plane of the aperture.

**MELANELLA STAMINA, new species**

Shell small, slender, white, smooth and polished, flat-sided, acute conic, the apex minute and blunt; shell with about seven flattish whorls; suture distinct, closely appressed, not glazed over, with no visible sculpture, last whorl less than half as long as the shell; the spire straight; base elongately rounded, imperforate; aperture elon-

gate, narrow, the margins thin, the outer lip slightly convexly produced medially, the inner lip a little raised with no umbilical dimple. Length of shell, 4.75; of aperture, 1.7; diameter, 1.25 mm. U. S. Nat. Mus. Cat. No. 108038.

Off Fernandina, many specimens.

Slender and very straight, approaching *Strombiformis* in form.

MELANELLA PATULA Dall and Simpson

*Eulima patula* DALL and SIMPSON, Moll. Porto Rico, p. 413, pl. 57, fig 3, 1901.

Off Georgia, 20 specimens. Porto Rico, in Mayaguez Harbor, 5 specimens.

MELANELLA VERSA, new species

Shell small, transparent whitish with obscure olivaceous nebulosities, about nine whorls, a minute blunt apex, dextrally wholly arcuate; suture distinct, not glazed over; surface smooth and polished; aperture ovate, posterior commissure acute; outer lip strongly arcuately produced; inner lip short, thick, the base evenly attenuated, imperforate; the last whorl about one-half the whole length. Length, 4.5; diameter, 1.5 mm. U. S. Nat. Mus. Cat. No. 108043.

Off Fernandina, one specimen.

The shell is somewhat discolored by its sojourn on the bottom, but the olivaceous clouding seems normal.

MELANELLA IRA, new species

Shell minute, slender, white, with about nine slightly convex whorls, the apex minute, rounded; surface polished without sculpture, the suture glazed over; last whorl about one third the whole length in the adult; aperture ovate, the outer lip moderately arcuate, the inner lip callous, slightly raised with a narrow depression behind it; base rounded, slightly produced. Length, 4.6; diameter, 1.3 mm. U. S. Nat. Mus. Cat. No. 108036.

Off Fernandina and Georgia, many specimens.

This comes pretty close to the form of *Aclis*.

MELANELLA PARALLELLA, new species

Shell small, slender, white, straight, with a slightly irregular minute nucleus and about nine whorls; suture distinct, not glazed over, one or more varical grooves to each whorl; the sides of the whorls are flat, there are also axial feeble irregular wrinkles covering them; the anterior edge of the whorls in the later part of the shell slightly bulging; aperture ovate, body and pillar with a coat of enamel; base rather abruptly rounded, imperforate; a narrow depression behind the inner lip; outer lip very slightly arcuate. Length, 5; of last whorl, 1.5; diameter, 1.2 mm. U. S. Nat. Mus. Cat. No. 108378.

Off Georgia, not rare.

**Genus STROMBIFORMIS Da Costa****STROMBIFORMIS ELATA, new species**

Shell slender, whitish, thin, with a somewhat swollen nucleus and about nine moderately convex whorls; suture distinct, whorls smooth and polished, last whorl less than half the whole length; aperture ovate, a thin callus on the inner lip; base ovately rounded, outer lip arcuately produced. Length, 6.75; diameter, 1.6; last whorl, 2.5 mm. U. S. Nat. Mus. Cat. No. 108381.

Off Georgia, a dozen dilapidated specimens.

**STROMBIFORMIS FUSUS Dall**

*Eulima (Liostraca) fusus* DALL, Bull. Mus. Comp. Zool., vol. 18, p. 329, pl. 19, fig. 11b, 1889.

Off Fernandina, 18 specimens. Off Havana in 400 fathoms; temperature 39.75° F., Yucatan Strait, 640 fathoms; U. S. S. *Blake*.

**Genus NISO Risso****NISO MICROFORIS, new species**

Shell small, conic (discolored but probably) white, with no trace of color at periphery or at the varical grooves; whorls flat, about 10 in number, suture distinct; last whorl obscurely carinate at the periphery, base rounded, umbilicus minute and not carinate at the margin; aperture rounded-quadrate, hardly angulate in front. Length, 9.5; diameter, 4 mm. U. S. Nat. Mus. Cat. No. 108374.

Off Georgia, one adult and two young specimens.

This has a smaller and less carinate umbilicus than any other figured species. The young specimens are whitish. The varical grooves are feeble.

**Genus ACLIS Lovén****ACLIS GEORGIANA, new species**

Shell minute, subcylindrical, polished, white, with a blunt apex and about six well rounded whorls; suture distinct, deep, not appressed; sculpture only of faint incremental lines; base rounded, aperture obliquely ovate, the margins thin, the outer lip protractively arcuate medially, the axis imperforate. Length of shell, 3; of aperture, 1; diameter, 1 mm. U. S. Nat. Mus. Cat. No. 108020.

Off Fernandina and Georgia, numerous.

This resembles *A. bermudensis* Dall and Bartsch, but is larger and more cylindrical.

**ACLIS DALLI Bartsch**

*Acis dalli* BARTSCH, Proc. U. S. Nat. Mus., vol. 40, No. 1829, p. 435, pl. 59, fig. 1, May, 1911.

Shell small, slender, acute, translucent white, polished, with about a dozen well rounded whorls, the apex blunt; suture distinct, rather deep, not appressed; sculpture of faint flexuous incremental lines;

base briefly rounded, aperture rounded, the margin thin, the outer lip flexuous, a minute chink behind the inner lip. Length of shell, 6.7; of aperture, 1.0; diameter, 1.6 mm. U. S. Nat. Mus. Cat. No. 108025.

Off Georgia and Fernandina, very common. Also in 780 fathoms off Cuba; Dr. W. H. Rush.

This appears to be the most common species of the region.

*ACLIS LIMATA*, new species

Shell small, acute-conic, thin, translucent white, polished, with a minute blunt apex and about seven whorls; suture distinct, closely appressed, not glazed over; later whorls slightly overhanging the succeeding suture; sculpture of very fine close flexuous incremental lines only visible under magnification; base evenly rounded, imperforate; aperture ovate, outer lip produced medially, thin, rounding into the arcuate inner lip. Length of shell, 4; of aperture, 0.8; diameter, 1.5 mm. U. S. Nat. Mus. Cat. No. 108044.

Off Fernandina, one specimen.

This has much the shape of some of the smaller *Melanellas*, but the thin shell is more like *Aclis*.

*ACLIS STILIFER*, new species

Shell minute, conic, white, polished, with a small blunt apex and about six moderately rounded whorls, of which the earlier ones are more rapidly attenuated; suture distinct, appressed, not deep or glazed over; sculpture only of faint flexuous incremental lines; aperture rounded-ovate, with a thin margin, a narrow chink behind the inner lip, the base briefly rounded. Length of shell, 2.5; of aperture, 1.2; diameter, 1.4 mm. U. S. Nat. Mus. Cat. No. 108024.

Off Georgia and Fernandina, not rare.

Some of the incremental lines are more deeply impressed than others.

*ACLIS FERNANDINAE*, new species

Shell minute, conical, white, with a very minute blunt smooth nucleus hardly differentiated from the succeeding moderately convex whorls; suture distinct, deep; sculpture only of faint incremental lines, some of which at long intervals are deeper than the rest; surface polished; base rounded; aperture short, ovate, with simple margins; a slight chink behind the inner lip. Length of shell, 2.9; of aperture, 0.5; diameter, 1 mm. U. S. Nat. Mus. Cat. No. 108047.

Off Fernandina, three specimens.

With the form described as typical are others more slender but otherwise entirely similar. This resembles *A. stilifer* but the increase of the spire is more regular, the last whorl not so conspicuous, and the suture markedly deeper.



**ACLIS PENDATA, new species**

Shell small, white, polished, acute-conical, with a minute apical and eight or nine subsequent moderately rounded whorls; suture distinct, not appressed; sculpture only of extremely feeble flexuous incremental lines; base shortly rounded; aperture shortly ovate, the margin thin, the outer lip arcuately produced, the anterior margin of the aperture slightly patulous; the inner lip raised, with a minute umbilical perforation behind it. Length of shell, 5; of aperture, 1.3; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 108021.

Off Fernandina and Georgia, 35 specimens.

**ACLIS CONULA, new species**

Shell small, smooth, white, conical, with a minute blunt apex and about seven moderately convex whorls; suture distinct, not deep nor appressed; sculpture only of faint incremental lines, some of which at rare intervals are more pronounced than others; aperture short-oval, the margins not thickened, the body without callous deposit; the outer lip protractively arcuate medially; the inner lip concavely arcuate with a minute chink behind it, the base rather abruptly rounded. Length of shell, 3.7; of aperture, 1.1; diameter, 1.7 mm. U. S. Nat. Mus. Cat. No. 108022.

Off Fernandina, one specimen.

**ACLIS LATA Dall**

*Aclis (supranitida* Wood, var.?) *lata* DALL, Bull. Mus. Comp. Zool., vol. 18, p. 324, pl. 18, fig. 8, 1889.

Shell small, elongate-conic, white, with a minute blunt apex and about a dozen slightly convex whorls; suture shallow, appressed; sculpture only of oblique irregular incremental lines, somewhat stronger on the early whorls; aperture short, almost rounded, base abruptly rounded; outer lip thin, slightly arcuate; inner lip with a minute perforation behind it. Length of shell, 7.6 to 10.5; of aperture, 1.5 to 2; diameter, 2.7 to 3 mm. U. S. Nat. Mus. Cat. No. 108041.

Off Fernandina and Georgia, numerous specimens. Barbados in 100 fathoms, U. S. S. *Hassler*; type.

**ACLIS PYRAMIDA, new species**

Shell small, short-conic, white, smooth, polished, with five and a half moderately rounded whorls; apex blunt, suture well impressed, last whorl about half the length of the shell; base evenly rounded and minutely perforate; aperture subcircular, lips thin, outer lip prominently arcuate forward. Length, 2; diameter, 1.1 mm. U. S. Nat. Mus. Cat. No. 108223.

Off Fernandina, one specimen.

## ACLIS TENUIS Verrill

*Aclis tenuis* VERRILL, Trans. Conn. Acad., vol. 5, p. 528, pl. 58, fig. 19, 1882.

Off Georgia, nine specimens. Off Marthas Vineyard, 100 fathoms, United States Fish Commission.

## ACLIS CUBANA Bartsch

*Aclis cubana* BARTSCH, Proc. U. S. Nat. Mus., vol. 40, No. 1829, p. 435, pl. 59, fig. 2, 1911.

Off Fernandina, 20 specimens. Off Cuba in 780 fathoms mud; Dr. W. H. Rush.

## ACLIS RHYSSA, new species

Shell small, slender, subcylindrical, translucent white, polished, with nine or ten well rounded whorls; the apex blunt, the nuclear whorl small and slightly tilted, suture constricted; axial sculpture of numerous (on the last whorl about 15) somewhat sharp wrinkles, strongest at and behind the periphery where they sometimes give an obscurely angulate appearance just behind the middle of the whorl, and are a little retractively flexuous; the strength of these wrinkles varies in different specimens, some of them are nearly smooth on the later whorls; the base is evenly rounded and imperforate; the aperture ovate, with thin margins. Length of type specimen, 6; diameter, 1.3 mm. U. S. Nat. Mus. Cat. No. 108389.

Off Georgia, very numerous. Off Fernandina, one specimen.

This species is somewhat like *A. dalli* but more cylindrical and with more constricted suture, while *A. dalli* has no axial sculpture except faint incremental lines.

## ACLIS HENDERSONI, new species

Shell small, translucent white, with two transparent apical whorls and seven subsequent whorls; suture deep; early whorls with two peripheral elevated threads, later four, then on the last three whorls the posterior thread becomes a well defined keel at the shoulder while the other threads become obsolete; base well rounded, imperforate; axial sculpture of faint incremental lines; aperture obliquely ovate, the peristome expanded and even somewhat reflected, thin and simple. Length, 4.3; last whorl, 1.7; diameter, 1.3 mm. U. S. Nat. Mus. Cat. No. 333465.

Off Fernandina and Georgia, one specimen each.

This recalls *A. floridana* Bartsch, but is larger and with much more emphatic sculpture. The young shell is spirally threaded over the base and on the last whorl.

## Subgenus AMBLYSPIRA Dall

## ACLIS (AMBLYSPIRA) IMMACULATA, new species

Shell minute, subcylindrical, polished, white with a blunt apex and about six nearly flat-sided whorls; suture obscure, flatly appressed,

having the aspect of being overglazed; sculpture only of nearly imperceptible incremental lines; base somewhat prolonged, rounded; aperture ovate, outer lip thin, produced medially, evenly rounded into a short slightly concave inner lip. Length of shell, 3.2; of aperture, 0.7; diameter, 1 mm. U. S. Nat. Mus. Cat. No. 108037.

Off Fernandina, numerous.

Genus **MUCRONALIA** A. Adams

**MUCRONALIA MAMMILLATA**, new species

Shell spindle-shaped, thin, translucent white, with a minute subcylindrical initial whorl and about three subsequent, moderately convex, smooth, polished whorls, the last of which is much the largest; suture closely appressed; base attenuated; aperture narrow, sublunate, the margins thin, simple, outer lip nearly straight, slightly retractive anteriorly. Length of shell, 4; of aperture, 1.5; diameter, 1.5 mm. U. S. Nat. Mus. Cat. No. 108040.

Off Fernandina, one specimen.

This has somewhat the form of an *Olivella*.

**MUCRONALIA SUAVA**, new species

Shell small, spindle-shaped, slender, translucent white, with a brownish styliform nucleus of two and about four and a half slightly convex subsequent whorls; suture closely appressed, distinct; sculpture of fairly evident incremental lines; last whorl more than half as long as the shell; base attenuated, imperforate; aperture narrow, margins thin, simple, outer lip nearly straight, anteriorly receding; inner lips slightly raised. Length of shell, 5.5; of aperture, 1.8; diameter, 1.9 mm. U. S. Nat. Mus. Cat. No. 108392.

Off Georgia, three specimens.

This is of the same general type as *M. mammillata* but is larger, and the transition from the mucro to the normal whorls is less abrupt.

**MUCRONALIA ? BULIMULOIDES**, new species

Shell much the shape of a slender *Bulimulus* or *Lymnaea*, white, translucent, with seven moderately convex whorls, including two slightly brownish nuclear whorls; suture distinct, not deep; surface brilliantly polished, with faint incremental lines; a faint varical groove on each whorl; last whorl more than half as long as the shell (3.7 mm.); base gently attenuated, imperforate; aperture elongate-oval, outer lip thin, moderately convexly arcuate; inner lip thin, nearly straight, slightly raised, no callus on it or on the body. Length, 6; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 108382.

Off Georgia, five specimens.

There is some doubt as to the proper place of this shell, as the nuclear whorls are abruptly separated from the others, but otherwise

the characters agree well with those of *Mucronalia*, and it seems best to place it tentatively with that group.

### Genus *STILIFER* Broderip

#### *STILIFER VERRILLI*, new species

Shell small, inflated turbate, white, polished, with a minute styliform apex and about three globose rapidly enlarging whorls; suture appressed, distinct, not deep; sculpture of very faint incremental lines, and a slight wrinkling along the anterior edge of the suture; base imperforate, rounded, aperture ample, outer lip thin, inner lip somewhat thickened. Length, 4; diameter, 3.5 mm. U. S. Nat. Mus. Cat. No. 108111.

Off Fernandina, one specimen.

At first sight this would be taken for a mutation of *S. stimpsoni* Verrill, but the second whorl is much smaller than in that species.

The last whorl comprises most of the shell.

#### *STILIFER MINIMA*, new species

Shell minute, turbiniform, thin, white polished, with a minute styliform brownish nucleus of two and about three subsequent inflated whorls; suture very distinct, rather deep; sculpture only of extremely faint incremental lines; base plumply rounded, imperforate; aperture wide, semilunate, the margins thin and sharp. Length of shell, 3; of aperture, 1.4; diameter, 1.9 mm. U. S. Nat. Mus. Cat. No. 108039.

Off Fernandina, four specimens.

#### *STILIFER MINUTA*, new species

Shell minute, transparent, thin, with a minute styliform brownish nucleus of about three, and three subsequent whorls; suture distinct, narrowly appressed; surface with faint incremental lines but no other sculpture; the general form is like a short *Bulimulus*; the last whorl about three-fifths of the whole shell; base rounded; aperture semilunate, the margins thin, the inner lip a little raised but with no indication of an umbilical dimple. Length, 2; diameter, 1.7 mm. U. S. Nat. Mus. Cat. No. 108227.

Off Fernandina, one specimen.

This resembles *S. minima* but is smaller and proportionately more globose. It is the smallest species I have seen.

### Family PYRAMIDELLIDAE

This family is well represented in the collection by 24 species, all supposed to be new, but very unequally represented at the two stations. Off Fernandina 19 species and 250 specimens were obtained, but of these 194 specimens represented only 4 species. Off Georgia only 30 specimens of 8 species were obtained. Only 3 species, total-

ing 21 specimens, were represented at both stations. *Strioturbonilla* was the group most numerous represented; there are three *Odostomias*, and five species representing subordinate groups of the genus *Pyramidella*.

The species of this family included in this paper have been studied and described by my colleague, Dr. Paul Bartsch, who should be cited as the authority for the specific names.

**Genus PYRAMIDELLA Lamarck**

**Subgenus LONGCHAEUS Mörch**

**PYRAMIDELLA (LONGCHAEUS), species**

A young specimen of 4.5 whorls, Cat. No. 107927, U.S.N.M., was dredged at United States Bureau of Fisheries Station 2668, in 294 fathoms, sandy bottom, 46.3° F. bottom temperature, off Fernandina, Fla.

**Subgenus SULCORINELLA Dall and Bartsch**

**PYRAMIDELLA (SULCORINELLA) CAMARA, new species**

Shell elongate-ovate, bluish white with a narrow opaque band a little anterior to the summit of the whorls. Nuclear whorls forming a depressed helicoid spire the axis of which is at right angles to that of the succeeding turns, in the first of which the nuclear spire is deeply immersed, only two-fifths of its tilted edge projecting. Post-nuclear whorls flattened, with a concave shoulder at the summit, smooth excepting fine incremental lines and exceedingly fine spiral striations. Suture deeply channeled. Periphery of the last whorl provided with a rather strong narrow keel. The summit of the succeeding turns falls a little anterior to this keel and thus produces the broadly channeled suture. Base short, slightly rounded, narrowly, openly umbilicated, marked like the spire. Aperture rhomboidal; posterior angle obtuse; outer lip thin; inner lip curved, reflected over but not appressed to the base, provided with a strong oblique fold at its insertion.

The type, Cat. No. 108383, U.S.N.M., comes from United States Bureau of Fisheries Station 2415, in 440 fathoms, sandy bottom, 45.6° bottom temperature, off Georgia. It has five postnuclear whorls and measures. Length, 2.8 mm.; diameter, 1.3 mm.

Cat. No. 360168, U.S.N.M., contains two additional specimens from the type locality.

**Subgenus SYRNOLA A. Adams**

**PYRAMIDELLA (SYRNOLA) FERNANDINA, new species**

Shell elongate-conic, slender, milk white. Nuclear whorls two and a half, forming a depressed helicoid spire, the axis of which is at right angles to that of the succeeding turns, in the first of which the nuclear spire is about one-third immersed. Postnuclear whorls flattened,

narrowly shouldered at the summit, marked by incremental lines and exceedingly fine spiral striations only. Suture slightly constricted. Periphery of the last whorl well rounded. Aperture elongate-ovate; posterior angle acute; outer lip thin; inner lip almost vertical, provided with an obsolete fold a little anterior to the insertion of the columella.

The type, Cat. No. 108051, U.S.N.M., comes from United States Bureau of Fisheries Station 2668, in 294 fathoms, sandy bottom, 46.3° bottom temperature, off Fernandina, Fla. It has nine postnuclear whorls and measures: Length, 6 mm.; diameter, 1.4 mm.

Cat. No. 108065, U.S.N.M., contains 10 additional specimens from the type locality and Cat. No. 108364, U.S.N.M., contains 2 from United States Bureau of Fisheries Station 2415, in 440 fathoms, sandy bottom, 45.6° bottom temperature, off Georgia.

**PYRAMIDELLA (SYRNOLA) FLORIDANA, new species**

Shell elongate-conic, cream yellow. Nuclear whorls at least one and a half, forming a very depressed helicoid spire which is obliquely almost half immersed in the first of the succeeding turns. The last nuclear whorl projects materially beyond the outline of the postnuclear spire. Postnuclear whorls slightly rounded, narrowly shouldered at the summit, marked by fine incremental lines and very closely spaced microscopic spiral striations. Suture moderately constricted. Periphery of the last whorl well rounded. Base moderately prolonged, well rounded. Aperture elongate oval; posterior angle obtuse; outer lip thin; inner lip almost straight, reflected over and appressed to the base for about one-third of its length, provided with an obsolete, oblique fold a little anterior to its insertion.

The type, Cat. No. 108056, U.S.N.M., was dredged at United States Bureau of Fisheries Station 2668, in 294 fathoms, sandy bottom 46.3° bottom temperature, off Fernandina, Fla. It is an immature specimen of 5.5 whorls and measures: Length, 3.5 mm.; diameter 1.1 mm.

**PYRAMIDELLA (SYRNOLA) GEORGIANA, new species**

Shell elongate-ovate, bluish white, semitranslucent. Nuclear whorls very small, immersed in the first of the postnuclear turns, above which the rounded edge of the last volution only projects. Postnuclear whorls well rounded, moderately shouldered at the summit, marked by lines of growth and fine, closely spaced microscopic spiral striations only. Suture scarcely constricted. Periphery of the last whorl well rounded. Base short, strongly rounded, marked like the spire. Aperture oval; posterior angle acute; outer lip fractured, showing four spiral lirations within, of which two are anterior to the periphery and the other two are about an equal distance posterior to it; inner lip stout, reflected and appressed to the base for half its length and provided with a rather strong fold a little anterior to its insertion.

The type, Cat. No. 108366, U.S.N.M., comes from United States Bureau of Fisheries Station 2415, 440 fathoms, sandy bottom, 45.6° bottom temperature, off Georgia. The type has 6.1 postnuclear whorls and measures: Length, 5.2 mm.; diameter, 2.2 mm.

Cat. No. 107992, U.S.N.M., contains another specimen from United States Bureau of Fisheries Station 2668 in 294 fathoms, sandy bottom, 46.3° bottom temperature, off Fernandina, Fla.

### Genus **TURBONILLA** Risso

#### Subgenus **PTYCHEULIMELLA** Sacco

#### **TURBONILLA (PTYCHEULIMELLA) HESPERA**, new species

Shell elongate-conic, bluish white. Nuclear whorls two and a half forming a depressed helicoid spire, the axis of which is almost at right angles to that of the succeeding turns, in the first of which the nuclear spire is about one-fourth immersed. The edge of the nuclear spire extends slightly beyond the outline of the postnuclear spire on the left side. Postnuclear whorls rather high between summit and suture, very narrowly shouldered at the summit, the early ones marked by feebly developed, protractively slanting axial ribs, which are broader than the spaces that separate them. They are too ill defined to permit of proper counting. In addition to the obsolete ribs the spire is marked by fine lines of growth and very closely spaced microscopic spiral striations. Periphery of the last whorls strongly rounded. Base very short, inflated, strongly rounded. Aperture broadly oval; posterior angle obtuse; outer lip thin; inner lip almost straight, slender, slightly reflected and appressed to the base for the posterior half of its length, provided with an obsolete fold near its insertion.

The type, Cat. No. 360181, U.S.N.M., comes from United States Bureau of Fisheries Station 2668 in 294 fathoms, sandy bottom, 46.3° bottom temperature off Fernandina, Fla. It has 10 postnuclear whorls and measures: Length 5.3 mm.; diameter, 1.2 mm.

Cat. No. 360169, U.S.N.M., contains another specimen from the type locality.

#### **TURBONILLA (PTYCHEULIMELLA) MELEA**, new species

Shell small, slender, elongate-conic, milk white. Nuclear whorls two and a half, forming a depressed helicoid spire having its axis at right angles to that of the succeeding turns, in the first of which the nuclear spire is about one-third immersed. Postnuclear whorls flattened, very narrowly shouldered at the summit, marked by somewhat irregularly developed and spaced obsolete axial ribs, which are so ill defined that they do not permit of counting, and fine lines of growth and closely spaced microscopic striations only. Suture moderately constricted. Periphery of the last whorl well rounded. Base short, well rounded, marked by the fine spiral sculpture only. Aperture

oval; posterior angle acute; outer lip fractured; inner lip slightly twisted, reflected over and appressed to the base for the posterior third of its length, provided with an obsolete fold a little anterior to the insertion of the columella.

The type, Cat. No. 108057, U.S.N.M., comes from United States Bureau of Fisheries Station 2668 in 294 fathoms, sandy bottom, 46.3° bottom temperature, off Fernandina, Fla. It has 6.7 postnuclear whorls and measures: Length, 3.3 mm., diameter, 0.8 mm.

Cat. No. 360170, U.S.N.M., contains an additional specimen from the type locality.

Subgenus *STRIOTURBONILLA* Sacco

*TURBONILLA* (*STRIOTURBONILLA*) *NEMEA*, new species

Shell small, elongate-conic, bluish white, semitranslucent. Nuclear whorls two and a half, forming a depressed helicoid spire which has its axis at right angles to that of the succeeding turns, in the first of which it is about one-fifth immersed. The nuclear spire is large and projects beyond the outline of the postnuclear spire on both sides. Postnuclear whorls moderately rounded, almost appressed at the summit, marked by very strong, protractively slanting axial ribs, of which 16 occur upon the first to fifth, 18 upon the sixth and seventh, 20 upon the eighth and last turn. The ribs are strong and extend prominently from the summit to the periphery. They are a little wider than the spaces that separate them. Suture moderately constricted. Periphery of the last whorl well rounded. Base short, well rounded. Spire and base marked by fine incremental lines and exceedingly fine, wavy spiral striations. Aperture subquadrate; posterior angle obtuse; outer lip thin, showing the external sculpture within; inner lip almost straight, reflected and appressed for its posterior half to the base, provided with an obsolete fold a little anterior to its insertion.

The type, Cat. No. 108363, U.S.N.M., comes from United States Bureau of Fisheries Station 2415 in 440 fathoms, sandy bottom, 45.6° bottom temperature, off Georgia. It has 10 postnuclear whorls and measures: Length, 4.8 mm.; diameter, 1 mm.

Cat. No. 188277, U.S.N.M., contains nine additional specimens from the type locality.

*TURBONILLA* (*STRIOTURBONILLA*) *PYRRHA*, new species

Shell elongate-conic, milk white. Nuclear whorls two and a half, forming a depressed helicoid spire, the axis of which is almost at right angles to that of the succeeding turns, in the first of which the nuclear spire is about one-fourth immersed. The nuclear spire extends slightly beyond the outline of the postnuclear spire on the left side. Postnuclear whorls appressed at the summit, moderately rounded, marked



by rather strong, almost vertical axial ribs, of which 16 occur upon the first and second and 14 upon the remaining whorls. These axial ribs expand slightly near the summit, where they become enfeebled and are separated by spaces about one and a half times as wide as the ribs. Suture moderately constricted. Periphery of the last whorl rounded. Base very short, strongly rounded. Entire surface marked by closely spaced, fine spiral striations, which are best shown in the intercostal spaces. Aperture fractured anteriorly; posterior angle obtuse; inner lip provided with an obsolete fold near its insertion.

The type, Cat. No. 108052, U.S.N.M., comes from United States Bureau of Fisheries Station 2668 in 294 fathoms, sandy bottom, 46.3° bottom temperature, off Fernandina, Fla. It has nine postnuclear whorls and measures: Length, 3.3 mm.; diameter, 0.7 mm.

**TURBONILLA (STRIOTURBONILLA) THEONA, new species.**

Shell elongate-conic, bluish white, semi-translucent. Nuclear whorls two and a half, forming a rather large helicoid spire, the axis of which is almost at right angles to that of the succeeding turns, in the first of which the nuclear spire is about one-fifth immersed. Post-nuclear whorls moderately rounded, almost appressed at the summit, marked by low, rounded, almost vertical ribs, of which 20 occur upon the first to sixth, 22 upon the seventh and the last whorl. Intercostal spaces but feebly depressed. Suture moderately constricted. Periphery of the last whorl well rounded. Base short, strongly rounded, smooth. The entire surface of the shell is marked by fine lines of growth and very fine microscopic spiral striations. Aperture subquadrate; posterior angle obtuse; outer lip thin, showing the external markings within by transmitted light; inner lip almost straight, reflected over and appressed to the base for about a third of its length, provided with an obsolete fold near its insertion.

The type, Cat. No. 108059, U.S.N.M., comes from United States Bureau of Fisheries Station 2668 in 294 fathoms, sandy bottom, 46.3° bottom temperature, off Fernandina, Fla. It has nine postnuclear whorls and measures: Length, 4.6 mm.; diameter, 1.1 mm.

Cat. No. 108063, U.S.N.M., contains about 50 additional specimens from the type locality.

**TURBONILLA (STRIOTURBONILLA) ELECTRA, new species**

Shell rather large, elongate-conic, bluish white, semitranslucent. Nuclear whorls two and a half, forming a depressed helicoid spire, the axis of which is almost at right angles to that of the succeeding turns, in the first of which the nuclear spire is about one-fourth immersed. Postnuclear whorls moderately well rounded, narrowly shouldered at the summit, marked with slightly protractively slanting axial ribs, which are but feebly-developed. On the first turn they are merely

indicated. On the second 12 are present, 14 on the third to fifth, 16 on the sixth, 18 on the seventh and eighth, while on the last two turns they are quite obsolete. Intercostal spaces shallow, about as broad as the ribs. Sutures moderately constricted. Periphery of the last whorl well rounded, somewhat inflated. Base short, well rounded, slightly inflated. The entire surface of the shell marked by fine incremental lines and microscopic, closely spaced spiral striations. Aperture broadly oval; posterior angle neither acute nor obtuse; outer lip thin, showing the external sculpture within; inner lip slender, curve, reflected over the base for about half its length, provided with an obsolete fold near its insertion.

The type, Cat. No. 108066, U.S.N.M., comes from United States Bureau of Fisheries Station 2668 in 294 fathoms, sandy bottom, 46.3° bottom temperature, off Fernandina, Fla. It has 10.5 postnuclear whorls and measures: Length, 7 mm.; diameter, 1.8 mm.

Cat. No. 360171, U.S.N.M., contains about 50 additional specimens from the type locality.

**TURBONILLA (STRIOTURBONILLA) RHEA, new species**

Shell elongate conic, cream yellow. Nuclear whorls small, two and a half, forming a very depressed helicoid spire, the axis of which is almost at right angles to that of the succeeding turns, in the first of which it is about one-fifth immersed. Postnuclear whorls well rounded, almost appressed at the summit, marked by rather strong, slightly sinuous axial ribs, of which 16 occur upon the first to fifth, 18 upon the sixth, and 20 upon the remaining whorls. Intercostal spaces about as wide as the ribs. Suture rather strongly constricted. Periphery of the last whorl well rounded. Base short, strongly rounded. The entire surface of spire and base marked by fine incremental lines and exceedingly fine microscopic spiral striations. Aperture subquadrate; posterior angle obtuse; outer lip thin, showing the external sculpture within; inner lip thin, somewhat flexuous, reflected over and appressed to the base for half its length, provided with an obsolete fold near its insertion.

The type, Cat. No. 108055, U.S.N.M., comes from United States Bureau of Fisheries Station 2668, in 294 fathoms, sandy bottom, 46.3° bottom temperature, off Fernandina, Fla. It has 11.5 postnuclear whorls and measures: Length, 6.2 mm.; diameter, 1.3 mm.

Cat. No. 360172, U.S.N.M., contains about 40 specimens from the type locality.

**TURBONILLA (STRIOTURBONILLA) SIRENA, new species**

Shell large, robust, broadly elongate conic, milk white. Nuclear whorls two and a half, forming a rather large, depressed helicoid spire, the axis of which is at right angles to that of the succeeding turns, in the first of which it is about one-third immersed. The left side of

the nuclear spire projects beyond the outline of the postnuclear spire. Postnuclear whorls almost flattened, almost appressed at the summit, marked by very strong, slightly curved, almost vertical axial ribs, of which 16 occur upon the first to fourth, 18 upon the fifth to seventh, 20 upon the eighth, and 22 upon the last whorl. These ribs become slightly flattened and expanded near the summit of the whorls. The intercostal spaces are deep. Suture moderately constricted. Periphery of the last whorl well rounded. Base short, well rounded. The entire surface of the shell marked by rather close incremental lines and rather coarse spiral striations. Aperture subquadrate; posterior angle obtuse; anterior portion of the outer lip fractured; inner lip stout, reflected over and appressed to the base for about half its length, provided with an obsolete fold a little anterior to its insertion.

The type, Cat. No. 108060, U.S.N.M., comes from United States Bureau of Fisheries Station 2668, in 294 fathoms, sandy bottom, 46.3° bottom temperature, off Fernandina, Fla. It has 9.3 whorls and measures: Length, 7.3 mm.; diameter, 2.1 mm.

Cat. No. 108362, U.S.N.M., contains seven specimens from United States Bureau of Fisheries Station 2415, in 440 fathoms, sandy bottom, 45.6° bottom temperature, off Georgia.

**TURBONILLA (STRIOTURBONILLA) LETA, new species**

Shell small, pupoid, milk white. Nuclear whorls two and a half, forming a planorboid spire, the axis of which is obliquely placed to that of the succeeding turns, in the first of which the nuclear spire is about one-fourth immersed. Postnuclear whorls flattened, narrowly shouldered at the summit, the first with mere indications of axial ribs, while on the remaining turns they are more strongly developed, though on none prominent. Of these ribs, 12 occur upon the second, 14 upon the third, 16 upon the fourth and the last whorl. These ribs are low and broad and about as wide as the shallow spaces that separate them. Suture moderately constricted. Periphery of the last whorl well rounded. Base rather long, well rounded. The entire surface of spire and base marked by fine incremental lines and numerous closely spaced wavy spiral striations. Aperture oval; posterior angle acute; outer lip thin, showing the external sculpture within; inner lip somewhat curved, reflected and appressed to the base for about half its length and provided with an obsolete fold near its insertion.

The type, Cat. No. 108062, U.S.N.M., comes from United States Bureau of Fisheries Station 2668, in 294 fathoms, sandy bottom, 46.3° bottom temperature, off Fernandina, Fla. It has 6.1 postnuclear whorls and measures: Length, 3 mm.; diameter, 1 mm.

Cat. No. 360173, U.S.N.M., contains 14 additional specimens from the type locality.

**TURBONILLA (STRIOTURBONILLA) MYIA, new species**

Shell large, elongate conic. Nuclear whorls and early postnuclear whorls decollated. The six and a half remaining are well rounded, almost appressed at the summit, crossed by strong, almost vertical axial ribs of which 14 occur upon the first and 16 upon the remaining turns. These ribs become slightly enfeebled and expanded toward the summit. Intercostal spaces about as wide as the ribs, strongly impressed. Suture moderately constricted. Periphery of the last whorl strongly rounded. Base short, strongly rounded. Entire surface of spire and base marked by rather strong lines of growth and numerous moderately strong spiral striations. Aperture subquadrate; posterior angle obtuse; outer lip fractured; inner lip almost straight, stout, reflected over and appressed to the base for about half its length, provided with an obsolete fold a little anterior to its insertion.

The type, Cat. No. 347844, U.S.N.M., comes from United States Bureau of Fisheries Station 2415, in 440 fathoms, sandy bottom, 45.6° bottom temperature, off Georgia. It consists of the last 6.5 whorls which measure: Length, 7.9 mm.; diameter, 2.3 mm.

Cat. No. 108287, U.S.N.M., contains another specimen from the same locality.

**TURBONILLA (STRIOTURBONILLA) ENNA, new species**

Shell slender, elongate-conic, bluish white, semitranslucent. Nuclear whorls forming a rather large, depressed helicoid spire, which has two and a half whorls. Postnuclear whorls well rounded, rather high between summit and suture, marked by moderately strong, almost vertical axial ribs, of which 16 occur upon all but the last two turns, which have 18. Intercostal spaces about as wide as the ribs. Suture rather strongly constricted. Periphery of the last whorl well rounded. Base moderately long, well rounded, smooth excepting the incremental lines and fine, closely spaced spiral striations, which are characteristic of both base and spire. Aperture elongate oval; posterior angle obtuse; outer lip thin; inner lip almost straight, reflected over and appressed to the base for about half its length, provided with an obsolete fold a little anterior to its insertion.

The type, Cat. No. 360175, U.S.N.M., comes from United States Bureau of Fisheries Station 2668, in 294 fathoms, sandy bottom, 46.3° bottom temperature, off Fernandina, Fla. It has 8.5 postnuclear whorls, having lost the tip and probably a fraction of the first postnuclear turn, and measures: Length, 4.2 mm.; diameter, 0.9 mm.

Cat. No. 360176, U.S.N.M., contains a young specimen from the type locality, from which we have described the nuclear characters.

**TURBONILLA (STRIOTURBONILLA) IDOTHEA, new species**

Shell small, broadly elongate-conic, white. Nuclear whorls decolated. Postnuclear whorls well rounded, very narrowly shouldered at the summit, marked with strong, slightly protractively slanting axial ribs, of which 16 occur upon all but the last turn, which has 18. Intercoastal spaces about one and a half times as wide as the ribs, crossed by two incised spiral lines which are stronger than the rest. One of these is at the periphery and the other about two-fifths between the summit and the periphery anterior to the summit. The space between these two incised lines is crossed by 20 equal and equally spaced spiral striations, and the space between the anterior incised line and the summit by 9. Suture moderately constricted. Periphery of the last whorl well rounded. Base short, strongly rounded, marked by the feeble continuations of the axial ribs, which evanesce before reaching the middle of the base, and numerous closely spaced wavy spiral striations. Aperture moderately large, subquadrate; posterior angle obtuse; outer lip thin; inner lip almost straight, reflected and appressed to the base for the posterior third of its length, provided with a feeble fold a little anterior to its insertion.

The type, Cat. No. 360177, U.S.N.M., comes from United States Bureau of Fisheries Station 2668, in 294 fathoms, sandy bottom, 46.3° bottom temperature, off Fernandina, Fla. It has six whorls remaining, having lost the nucleus and a fraction of the first postnuclear whorl, and measures: Length, 3 mm.; diameter, 1 mm.

**TURBONILLA (STRIOTURBONILLA) NONICA, new species**

Shell elongate-conic, milk white. Nuclear whorls two and a half, forming a depressed helicoid spire, the axis of which is almost at right angles to that of the succeeding turns, in the first of which the nuclear spire is about one-fourth immersed. Postnuclear whorls tabulately shouldered, well rounded, somewhat constricted at the suture, marked by moderately strong, somewhat curved, retractively slanting axial ribs which are poorly developed on the first whorl, and of which 20 occur upon the second, 22 upon the fourth, 24 upon the fifth, 26 upon the sixth, and 30 upon the last turn. Intercoastal spaces about as wide as the ribs, crossed by 34 fine spiral striations which are about equal, except those at the summit, which are finer and more closely spaced. Suture strongly constricted. Periphery of the last whorl inflated. Base short, inflated, marked by the continuations of the axial ribs, which extend to the umbilical chink, and spiral sculpture similar to that of the spire. Aperture oval; posterior angle acute; outer lip thin; inner lip short, reflected over and appressed for two-

thirds of its length to the base, provided with a weak fold at its insertion.

The type, Cat. No. 108061, U.S.N.M., comes from United States Bureau of Fisheries Station 2668, in 294 fathoms, sandy bottom, 46.3° bottom temperature, off Fernandina, Fla. It has 7.5 whorls and measures: Length, 4.9 mm.; diameter, 1.5 mm.

Subgenus PYRGISCUS Philippi

**TURBONILLA (PYRGISCUS) CONOMA, new species**

Shell large, very broadly elongate-conic, cream yellow. Nuclear whorls two and a half, forming a depressed helicoid spire, the axis of which is at right angles to that of the succeeding turns, in the first of which is about one-fifth immersed. First postnuclear whorls strongly rounded, inflated, smooth, the rest almost flattened, narrowly shouldered at the summit and crossed by stout, slightly protractively slanting axial ribs, of which 20 occur upon the second, 18 upon the third, 20 upon the fourth, 24 upon the fifth and sixth, and 26 upon the last whorl. These ribs are very broad and low and about twice as wide as the spaces that separate them. The intercostal spaces are marked by 13 subequally spaced incised spiral lines, of which the peripheral one is the strongest. In addition to this the entire surface is marked by numerous fine lines of growth and spiral striations. Periphery of the last whorl well rounded. Base short, well rounded, marked by about 16 incised, fine, irregularly spaced, wavy spiral striations. Aperture large, subquadrate; posterior angle obtuse; outer lip fractured; inner lip almost straight, stout, provided with an obsolete fold a little anterior to its insertion.

The type, Cat. No. 108049, U.S.N.M., comes from United States Bureau of Fisheries Station 2668, in 294 fathoms, sandy bottom, 46.3° bottom temperature, off Fernandina, Fla. It has 7.5 postnuclear whorls and measures: Length, 5.5 mm.; diameter, 2.1 mm.

Cat. No. 360178, U.S.N.M., contains an additional specimen from the type locality.

**TURBONILLA (PYRGISCUS) MIONA, new species**

Shell elongate-conic, bluish white. Nuclear whorls two, forming a depressed helicoid spire the axis of which is at right angles to that of the succeeding turns, in the first of which the nuclear spire is about one-fourth immersed. Postnuclear whorls well rounded, appressed at the summit, the first almost smooth, the rest marked by strong, slightly protractively slanting, low, rounded axial ribs, of which 20 occur upon the second and third, 18 upon the remaining turns. Intercostal spaces a little narrower than the ribs, crossed by eight incised spiral lines of which the posterior four are grouped in pairs. Suture moderately constricted. Periphery of the last whorl well rounded. Base

short, strongly rounded, marked by several incised spiral lines near the umbilicus. Aperture short, broadly oval; posterior angle acute; outer lip thin; inner lip almost straight, reflected over and appressed to the base for half its length and provided with a feeble oblique fold near its insertion.

The type, Cat. No. 108361, U.S.N.M., comes from United States Bureau of Fisheries Station 2415, in 440 fathoms, sandy bottom, 45.6° bottom temperature, off Georgia. It has eight postnuclear whorls and measures: Length, 4.2 mm.; diameter, 1.2 mm.

Cat. No. 360174, U.S.N.M., contains two additional specimens from the type locality.

Subgenus *MORMULA* A. Adams

*TURBONILLA* (*MORMULA*) *ANIRA*, new species

Shell broadly conic, white. Nuclear whorls two and a half, helicoid, forming a small spire, the axis of which is at right angles to that of the succeeding turns, in the first of which the nuclear spire is about one-fourth immersed. Postnuclear whorls strongly rounded, marked by strong, well-rounded, somewhat flexuous, slightly protractively slanting axial ribs, of which 22 occur upon the first, 20 upon the second, 18 upon the third, 20 upon the fourth and fifth, 22 upon the sixth and seventh, 24 upon the eighth, and 34 upon the last turn. At regular intervals several of these ribs are gathered into low, rounded varices. Intercostal spaces about one and a half times as wide as the ribs, crossed by the following spiral sculpture: A broad series of impressed pits encircles the whorls about two-fifths of the distance between the summit and periphery anterior to the summit. A peripheral pit about half as strong is present.\* Between this and the strong anterior pit there are eight incised spiral lines of somewhat varying strength, which divide the space between these two series of pits into subequal areas. Two additional incised lines are anterior to the strong anterior pit, which equal the slender lines anterior to the strong pit, in spacing. The space between the summit and this anterior incised line is crossed by numerous fine spiral striations. On the later turns the first basal pit, which equals the strong pit on the posterior portion of the whorls in width, is present in the suture and the space between this and the peripheral pit is crossed by a fine incised line. Suture moderately constricted. Periphery well rounded. Base short, well rounded, marked by about 12 fine incised spiral lines. Aperture large, broadly oval; posterior angle obtuse; outer lip thin; inner lip slender, reflected but not appressed to the base, provided with an obsolete fold at its insertion.

The type, Cat. No. 108058, U.S.N.M., comes from United States Bureau of Fisheries Station 2668, in 294 fathoms, sandy bottom, 46.3°

bottom temperature, off Fernandina, Fla. It has 9.5 postnuclear whorls and measures: Length, 8.3 mm.; diameter, 2.1 mm.

Cat. No. 360179, U.S.N.M., contains 12 additional specimens.

### Genus *ODOSTOMIA* Fleming

#### Subgenus *EVALEA* A. Adams

#### *ODOSTOMIA (EVALEA) FERNANDINA*, new species

Shell moderately large, elongate-ovate, milk white. Nuclear whorls immersed in the first of the postnuclear turns, above which the tilted edge of the last volution projects. Postnuclear whorls narrowly shouldered at the summit, almost flat, marked by incremental lines and very fine spiral striations only. Suture quite strongly constricted. Periphery of the last whorl well rounded. Base long, attenuated, well rounded, marked like the spire. Aperture fractured, apparently oval; posterior angle acute; outer lip thin; inner lip stout, reflected over and appressed to the base for almost its entire length as a heavy callus; a rather strong callus covers the parietal wall.

The type, Cat. No. 108053, U.S.N.M., comes from United States Bureau of Fisheries Station 2668, in 294 fathoms, sandy bottom, 46.3° bottom temperature, off Fernandina, Fla. It has 5.5 postnuclear whorls and measures: Length, 4 mm.; diameter, 1.3 mm.

Cat. No. 108076, U.S.N.M., contains another specimen from the type locality.

#### *ODOSTOMIA (EVALEA) RYCLEA*, new species

Shell of medium size, elongate-ovate, yellowish white. Nuclear whorls deeply obliquely immersed in the first of the succeeding turns, above which the tilted edge of the last volution only projects. Postnuclear whorls strongly rounded, very narrowly shouldered at the summit. Suture moderately constricted. Periphery of the last whorl inflated, well rounded. Base moderately long, inflated, narrowly umbilicated. Entire surface of spire and base marked by fine lines of growth and rather coarse spiral striations. The latter are particularly pronounced on the base. Aperture large, oval; posterior angle obtuse; outer lip thin; inner lip somewhat curved, reflected but not appressed to the base, provided with a feeble fold a little anterior to its insertion.

The type, Cat. No. 108365, U.S.N.M., comes from United States Bureau of Fisheries Station 2415, in 440 fathoms, sandy bottom, 45.6° bottom temperature, off Georgia. It has 4.5 postnuclear whorls and measures: Length, 3 mm.; diameter, 1.5 mm.

#### *ODOSTOMIA (EVALEA) RYALEA*, new species

Shell small, ovate, bluish white. Nuclear whorls deeply immersed in the first of the succeeding turns, above which the tilted edge of



the last turn only projects. Postnuclear whorls well rounded, marked by rather strong, slightly retractively slanting lines of growth and numerous closely spaced fine spiral striations. Periphery obsoletely angulated. Base inflated, narrowly, openly umbilicated, well rounded, marked like the spire. Aperture large, broadly oval; posterior angle obtuse; outer lip thin; inner lip strongly curved, reflected but not appressed to the base, provided with an oblique fold a little anterior to its insertion; parietal wall covered by a thin callus.

The type, Cat. No. 108108, U.S.N.M., comes from Bureau of Fisheries Station 2668, in 294 fathoms, sandy bottom, 46.3° bottom temperature, off Fernandina, Fla. It has 3.5 whorls and measures: Length, 2.5 mm.; diameter, 1.4 mm.

Cat. No. 360180, U.S.N.M., contains about 50 additional specimens from the type locality.

### Family PEDICULARIIDAE

#### Genus PEDICULARIA Swainson

##### PEDICULARIA DECUSSATA Gould

*Pedicularia decussata* GOULD, Proc. Boston Soc. Nat. Hist., vol. 5, p. 127, 1855; Otia, p. 215, 1862.

*Pedicularia albida* DALL, Bull. Mus. Comp. Zool., vol. 9, p. 39, 1881.

*Pedicularia decussata* DALL, Bull. Mus. Comp. Zool., vol. 18, p. 237, fig. 9a-b, 1889.

Off Fernandina and Georgia, 22 specimens.

Off Havana, in 450 fathoms on *Solenosmilia variabilis* Dumeril; Pourtalés. Yucatan Strait, in 640 fathoms; Blake expedition.

### Family SEGUENZIIDAE

#### Genus SEGUENZIA Jeffreys

##### SEGUENZIA FLORIDANA, new species

Shell small, white, trochiform, with a minute smooth translucent nucleus of about one whorl, and six subsequent whorls; spiral sculpture at first of one, later two and on the last whorl three sharp carinations, the anterior largest, on which the suture is laid; the base has three or four smaller but similar spirals; axial sculpture of extremely fine silky incremental lines; aperture with a short sulcus near the suture, the outer lip scalloped by the sculpture; the pillar short, twisted, with a prominent tooth anteriorly; base well rounded, imperforate. Height of shell, 5; of last whorl, 2.7; diameter, 4 mm. U. S. Nat. Mus. Cat. No. 108084.

Off Fernandina and Georgia, numerous; and off Cape Florida at United States Fish Commission Station 2644, in 193 fathoms, sand, temperature 43.4° F.

This resembles *S. monocingulata* Seguenza, but is larger, and the sculpture of the base is different.

SEGUENZIA RUSHI, new species

Shell small, depressed trochoid, with about five whorls; the early whorls have one, the later ones two, the last whorl three spiral keels on the anterior one of which the suture is laid; the base is moderately convex, with a deep funicular umbilicus; it is closely finely spirally threaded, the threads a little coarser near the umbilical margin; in the interspaces between the keels on the spire are very minute close spiral striae; aperture with a very shallow sulcus; the outer lip thin, modified by the sculpture; pillar short, twisted, its termination forming a prominent rounded projection hardly to be called a tooth. Height of shell, 2; diameter, 2.6 mm. U. S. Nat. Mus. Cat. No. 108085.

Off Fernandina and Georgia, 20 specimens.

This is somewhat like *S. carinata* Watson, but wants the carina and is smaller, perhaps the smallest species yet noted.

Family ALABINIDAE ?

Genus ALABINA Dall

*Finella* A. ADAMS (err. typ. pro *Fenella*), Ann. Mag. Nat. Hist., ser. 3, vol. 6, p. 332, 1866; type *Fenella pupoides* A. Adams.

*Fenella* A. ADAMS, Ann. Mag. Nat. Hist., ser. 3, vol. 13, p. 40, Jan. 1864.—CROSSE, Journ. de Conchyl., vol. 16, 1868, p. 46.—A. ADAMS, Ann. Mag. Nat. Hist., ser. 4, vol. 6, p. 122, Aug. 1870. Not *Fenella* Westwood, Syn. Gen. Brit. Insects, p. 54, 1840.

*Elachista* DALL and BARTSCH, Nautilus, vol. 15, No. 5, p. 58, Sept. 1901.—DALL, Moll. Porto Rico, p. 427, Nov. 1901. Not *Elachista* Treitschke, 1833.

*Alabina* DALL, Nautilus, vol. 15, No. 11, Mar. 1902, p. 127. Type *Bittium cerithioides* Dall.

? *Obtortio* HEDLEY, Mem. Austr. Mus., vol. 3, pt. 7, p. 412, Mar. 1899. Type *Rissoa pyrrhacme* Melvill and Standen.

*Styliferina* CARPENTER, 1864, not A. Adams, 1860.

An examination of specimens of *Fenella pupoides* received from Arthur Adams shows that the nuclear shell begins with two smooth translucent whorls followed by a single larger more inflated whorl and then spiral sculpture well defined, with no axial sculpture. The other Japanese species agree in this character of nucleus and so does the American type of *Alabina*. The nucleus of *Obtortio pyrrhacme* however, as described and figured by Hedley, has strong axial riblets and obviously belongs to a different group, and is not identical with the original *Fenella*.

**ALABINA CERITHIDIOIDES** Dall

*Alaba? cerithidioides* DALL, Bull. Mus. Comp. Zool., vol. 18, p. 258, 1889.

*Bittium (Styliferina) cerithidioides* DALL, Trans. Wagner Inst., vol. 3, p. 276, pl. 16, fig. 8, 1892.

*Bittium (Elachista) cerithidioides* DALL, Porto Rico Rept., p. 427, 1901; Nautilus, vol. 15, p. 58, 1901.

*Alabina cerithidioides* DALL, Nautilus, vol. 15, No. 11, p. 127, 1902.

Off Georgia, two specimens. Station 2315, off Key West, Fla., in 37 fathoms, coral, United States Fish Commission. Widely spread in the Antilles in moderate depths of water. Mayaguez Harbor, Porto Rico, 25-30 fathoms.

The specimens are probably washed from lesser depths of water.

**Family MATHILDIIDAE****Genus MATHILDA** Semper**MATHILDA GEORGIANA**, new species

Shell small, translucent white, with an inverted smooth nucleus and seven and a half subsequent whorls; suture distinct, not deep; axial sculpture of numerous rounded threads crossing from suture to suture, nodulous at their intersections with the major spirals, and with much wider interspaces; the incremental lines are not conspicuous; spiral sculpture on the spire of two, and on the last whorl of three, major cords, the former near the periphery with a wide interval between them; there are also fine threads, two behind the posterior cord, on the last whorl one between the peripheral cords and about eight on the flattish imperforate base which is not crossed by the axials except incremental lines; aperture rounded, margin thin, the inner margin with no chink behind it. Length of shell, 9.5; of aperture, 2.5; diameter, 4.2 mm. U. S. Nat. Mus. Cat. No. 108353.

Off Georgia, in large numbers.

This is one of the commonest forms found at this locality.

An examination of the radula of *M. diomedae* Dall, from Hawaii, shows a close relation of this genus to the Turritellidae.

**MATHILDA YUCATECANA** Dall

*Mathilda yucatecana* DALL, Bull. Mus. Comp. Zool., vol. 18, p. 266, pl. 20, fig. 7, 1889.

Shell small, pale brownish fading to white, with an inverted smooth nucleus and nearly six subsequent whorls; suture appressed; whorls well rounded, strongly sculptured; axial sculpture of numerous equal threads with wider interspaces, the threads most visible in the interspaces of the spirals; the sutural region is somewhat constricted; spiral sculpture of (on the spire two, on the last whorl three) strong cords near the periphery, with wider interspaces, more or less angulating

the whorls, and more or less nodulous at the intersections with the axial sculpture; besides these there are fine threads between the suture and the posterior cord, and also on the base; the reticulation is only conspicuous between the larger cords; base rounded, imperforate; the aperture rounded with simple, not thickened margins. Length of shell, 6.5; of last whorl, 3.3; diameter, 3.3 mm. U. S. Nat. Mus. Cat. No. 108090.

Off Fernandina and Georgia, not rare. Also in 640 fathoms, Yucatan Strait.

**MATHILDA LACTEOSA, new species**

Shell small, white, with a pale brownish periostracum, with a smooth inverted nucleus and about six and a half subsequent whorls; suture narrowly appressed, distinct; the whorls rather evenly rounded, the sculpture rather feeble in comparison with the other local species; axial sculpture of numerous slender threads extending from suture to suture, equal and equally distributed (except on the last whorl), with wider interspaces; incremental lines inconspicuous, except on the base; spiral sculpture of (on the first three whorls two, on the later ones three) moderately prominent cords at or near the periphery, and six or eight on the base; these are more or less microscopically spirally striate; there are between and on either side of the peripheral cords smaller spiral threads which form squarish reticulations with the axials; there is no obvious nodulation of the cords; base rounded, imperforate, a minute chink behind the thickened inner lip; aperture rounded, the margins thin, simple. Length of shell, 10; of last whorl, 4.8; diameter, 4.5 mm. U. S. Nat. Mus. Cat. No. 333453.

Off Georgia, one specimen.

Near *N. georgiana* but less slender, and with less prominent and slightly different sculpture.

**MATHILDA GLOBULIFERA, new species**

Shell small, subconic, white, with an inverted swollen nucleus and about five and a half subsequent whorls; suture distinct, appressed; spiral sculpture of a prominent peripheral cord with one or two smaller ones on each side of it, on the anterior one on the last whorl the suture is laid; the base is nearly smooth; axial sculpture of numerous rather thick threads, slightly concavely arcuate, and extending from suture to suture with narrower interspaces and little reticulate effect; base rounded, imperforate; aperture rounded, with thin margin. Length of shell, 5.2; of last whorl, 3.8; diameter, 2.4 mm. U. S. Nat. Mus. Cat. No. 108087.

Off Fernandina, two specimens.

This species is notable for its relatively very large nucleus and small size.

**MATHILDA GRANIFERA, new species**

Shell small (immature), with a translucent smooth inverted nucleus of a whorl and a half and six subsequent whorls; suture constricted, appressed; axial sculpture on the two earlier normal whorls of close-set small ribs crossing the whorls; spiral sculpture is gradually initiated by (on the following whorls one, on the later whorls two) series of prominent granules developed by spiral grooving, and there is a small plain thread in front of the suture; the base is margined by a small beaded thread with a minute plain one on each side of it, within this margin it is marked with radial feeble ridges; aperture rectangular with a sharp angulation in front of the very short pillar. Length of shell, 3; of last whorl, 1; diameter, 1.3 mm. U. S. Nat. Mus. Cat. No. 108356.

Off Georgia, one specimen.

The sculpture is so peculiar that it seemed desirable to describe this specimen in spite of its immaturity.

**MATHILDA AMAEA, new species**

Shell minute, creamy white, with an inverted nucleus and about five and a half well-rounded subturritid subsequent whorls; suture distinct, deep; spiral sculpture of (on the early whorls two, on the later ones three) small cords and another on the last whorl on which the suture is laid, in front of which the base is nearly smooth; all these except the last are obscured by the dense axial sculpture of strong equal and equally spaced threads with narrower interspaces crossing from suture to suture and not giving the aspect of reticulation; base slightly flattened, imperforate; aperture rounded with thin margins. Length of shell, 4.5; of last whorl, 2.5; diameter, 2.3 mm. U. S. Nat. Mus. Cat. No. 108089.

Off Fernandina and Georgia, common.

This except for the nucleus has much the look of the *Epitonium* to which the name *Amaea* has been applied.

**MATHILDA RUSHII Dall.**

*Mathilda rushii* DALL, Bull. Mus. Comp. Zool., vol. 18, p. 267, 1889.

Shell small, slender, subturritid, white, with a minute half immersed nucleus, and about nine subsequent moderately rounded whorls; suture distinct, deep; spiral sculpture of, on the spire two, on the last whorl three very obscure cords near the periphery, on the anterior one of the last whorl the suture is laid, within which the base is nearly smooth; axial sculpture of numerous strong threads, extending from suture to suture with narrower interspaces, almost hiding the spirals which do not nodulate the axials at their intersections; base imperforate, aperture short, rounded, with thin margins.

Length of shell, 7; of last whorl, 2; diameter, 1.8 mm. U. S. Nat. Mus. Cat. No. 108088.

Off Fernandina and Georgia, seven specimens. Bed of the Gulf Stream in 351 to 465 fathoms.

Named in honor of Dr. W. H. Rush, of the Navy, who made many additions to the fauna of the Florida Strait.

**MATHILDA HENDERSONI**, new species

Shell of moderate size, ruddy brown, with a transparent inverted nucleus of one whorl and eight subsequent whorls; suture closely appressed, obscure; spiral sculpture of a very prominent beaded cord overhanging the suture all the way down the spire, on the last whorl another on the margin of the base; between the suture and the cord on the spire are four or five equal close-set undulated threads, and a few fine intercalary threadlets; within the margin of the base are four or five similar threads; the space covered by this threading on the spire is constricted and that on the base flattish; axial sculpture of inconspicuous incremental lines; base imperforate, aperture rounded, the outer lip crenulate by the sculpture, thin, simple, the pillar lip short, slightly reflected. Length of shell, 10; of last whorl, 4.5; diameter, 4.5 mm. U. S. Nat. Mus. Cat. No. 333468.

Off Fowey Light, Florida coast, in 25 fathoms; J. B. Henderson, jr. Also Turtle Harbor, Fla., in 50 fathoms; Dr. W. H. Rush.

This remarkable and very characteristic species is named in honor of our late colleague, and comes from the same general area as the other species here described, though known so far from a lesser depth.

**Genus TUBA** Lea

**TUBA JEFFREYSI** Dall

*Tuba jeffreysi* DALL, Bull. Mus. Comp. Zool., vol. 18, p. 268, 1889.

Shell small, short, white, with an inverted smooth nucleus of one, and four subsequent whorls; suture distinct, deep; axial sculpture of numerous thin sharp lamellae crossing the whorls (including the base) with wider interspaces; spiral sculpture of two strong cords near the periphery, behind the posterior cord are two smaller ones between it and the preceding suture, and on the last whorl another on which the suture is laid; on the base are four more, all with wider interspaces reticulated by the axials but not nodulate at the intersections; on the last whorl a fine spiral thread occurs in some of the interspaces; base evenly rounded; aperture subcircular, with thin margins; behind the arcuate inner lip is a very narrow umbilical perforation. Length of shell, 6; of the last whorl, 4; diameter, 4 mm. U. S. Nat. Mus. Cat. No. 108086.

Off Fernandina, 10 specimens.

## Family TURRITELLIDAE

## Genus TURRITELLOPSIS G. O. Sars

## TURRITELLOPSIS FLORIDANA, new species

Shell minute, white, slender, with a smooth obliquely set nucleus of a whorl and a half and 8 well-rounded subsequent whorls; suture distinct, appressed; a space in front of the suture is smooth, beyond it are (on the early whorls 2, later 3, and on the last whorl 4) small simple equal and equally distributed threads with wider interspaces; the rounded base is smooth; axial sculpture of faint incremental lines and occasional indications of resting stages on the spire; base imperforate, aperture ovate, the outer lip thin, sharp, crenulated by the sculpture. Length, 2.6; diameter, 1 mm. U. S. Nat. Mus. Cat. No. 323856.

Off Fernandina, one specimen. Gulf of Mexico, off Cape San Blas, in 169 fathoms, at United States Bureau of Fisheries Station 2400; one specimen (type).

This is almost a replica in miniature of *T. acicula* Stimpson, but is more cylindrical and more regularly sculptured.

## Family TRIPHORIDAE

## Genus TRIPHORA Blainville

No species of typical *Triphora* occurs in the collection, but the genus is represented by numerous specimens belonging to two subgenera. These specimens however are rarely in perfect condition, most of them are more or less stained with manganese oxide and not over 1 in 100 retains the complete adult aperture. It is a curious fact that nevertheless in nearly half the individuals the smooth frail swollen protoconch is well preserved. Many of the specimens have the sculpture worn, which often greatly alters its appearance. Quite a number have been drilled by some carnivorous gastropod, which one would think must have been poorly repaid for its labor. All the species present the well defined aspect of deep sea forms.

Subgenus BIFORINA Bucquoy, Dautzenberg, and Dollfus

## TRIPHORA (BIFORINA) CARACCA, new species

Shell small, with 3 brown nuclear and 16 or more subsequent whitish whorls; form acute conical with flattish sides; suture obscure but its situation emphasized by the adjacent beaded cords; spiral sculpture of 2 strong prominently beaded cords with a small slightly undulated simple thread between them; there are also extremely fine close striae over the surface, only visible under magnification; on the anterior cord of the sixteenth whorl there are 17 beads; the base of the immature shell has a thin but rounded

edge which is buried in the suture; the base is nearly flat with a faint groove near the periphery and marked by flexuous radiating incremental lines; the pillar is short and the aperture subrectangular; there is no axial sculpture except incremental lines, and the beads are not arranged so as to give the effect of axial ribbing; on the early whorls the sculpture is smaller but similar; the nucleus may include beside the protoconch, which is smooth, 2 or sometimes 3 larval whorls. In the present specimens the protoconch and larval whorls have been worn smooth (if they originally had sculpture); the nepionic whorl shows an undulated smooth thread between two minutely beaded threads. Length of 16 whorls and nucleus, 8; maximum diameter, 2 mm. U. S. Nat. Mus. Cat. No. 108343.

Off Georgia, three specimens.

**TRIPHORA (BIFORINA) GEORGIANA, new species**

Shell small, whitish, acute conic, straight sided, with a brown nucleus consisting of a smooth protoconch and 2 succeeding whorls sculptured with 2 equal spiral threads, and numerous finer retractorily flexuous axial threadlets; these are succeeded by 15 slowly increasing flattish whorls; spiral sculpture of 2 subequal prominently beaded cords with 1 smaller undulated thread in front of them, which is the periphery of the base; there are also fine spiral striae visible under magnification in the interspaces; there is no axial sculpture except incremental lines, but the beads on the 2 cords are arranged in axially linked pairs which can be followed up the spire and give it a partially ribbed aspect; the axial lines of beads make about half a revolution around the spire; the base of the immature shell is flattish, with flexuous incremental lines and a sharp groove just inside the periphery, the canal is very short and slightly twisted. Length of nucleus and 15 whorls, 7.5; maximum diameter, 15 mm. U. S. Nat. Mus. Cat. No. 333516.

Off Georgia, six specimens.

There are 15 beads on the anterior cord of the last whorl.

**TRIPHORA (BIFORINA) INDIGENA, new species**

Shell small, whitish, with a brown nucleus consisting of the protoconch and 3 larval whorls, and 13 or more subsequent whorls; the spire is acute conical, the sides nearly straight, but the whorls slightly convex; the larval whorls are sculptured as in the preceding species; the adult whorls are spirally sculptured by two beaded cords with a smooth threadlet in front of them and a row of separate slightly smaller beads between the posterior cord and the preceding suture; there are 16 beads on the anterior cord of the penultimate whorl; these beads occur at the intersections of the cords with the same number of retractorily oblique flattish narrow riblets with subequal



interspaces, the series of which may be followed up the spire which they about one quarter encircle; the last whorl in the type specimen is partially preserved, except the outer lip of the aperture, and is smooth on the rounded base except for flexuous incremental lines, with a very short canal and a trace of the narrow sutural sulcus. Length of 13 whorls, 7; maximum diameter, 1.6 mm. U. S. Nat. Mus. Cat. No. 108345.

Off Georgia, two specimens.

A third species much larger than either of the preceding is indicated by fragments from off Fernandina, with three oblique rows of beads connected by rather sharp riblets in the later whorls, the posterior row splitting into two smaller spirals near the adult stage. The shell is thinner and more fragile than either of the others, and the latest whorl preserved has an axial length of 2 and a maximum diameter of 3 mm. U. S. Nat. Mus. Cat. No. 108079.

Subgenus *STROBILIGERA* Dall, 1924<sup>3</sup>

*TRIPHORA (STROBILIGERA) POMPONA*, new species

Shell small, white, slender, with a smooth inflated white protoconch of a whorl and a half, directly followed by 21 or more whorls of the adult sculpture; form acute conic, straight sided, the suture not constricted; spiral sculpture of a strong beaded cord at the periphery of the whorl and a similar one in front of it, the summits of the beads subcarinate; behind the posterior cord and between it and the preceding suture are two or three hardly undulated simple threadlets; in front of the anterior cord is an inconspicuous thread which is the periphery of the base and more or less obscured by the succeeding whorl; the beads on the two cords are obliquely linked in pairs by an axial ridge, and the series of pairs, though not conspicuous, may be followed up the spire; the axial sculpture otherwise is chiefly incremental; the immature base is flattish with flexuous incremental lines and a sharp spiral thread just inside the peripheral margin; the canal is very short and slightly recurved. Lengths of the nucleus and 20 whorls, 15; maximum diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 108339.

Off Georgia, very numerous, but mostly in poor condition. The inflated protoconch differs considerably in size, some being much larger than others, one specimen having a diameter 50 per cent greater than the next succeeding whorl, while others exceed that whorl very little. A larger but imperfect specimen measures about 20 mm. in length.

A variety (?) with exactly the same type and arrangement of sculpture, but the beading less prominent and the shell more slender and compact, measures 10 mm. for 15 whorls, and has a maximum dia-

<sup>3</sup> Type *Triphora iber* Dall (1889). Antilles. See Proc. Biol. Soc. Wash., vol. 37, p. 89, Feb. 21, 1924.

meter of 1.75 mm. U. S. Nat. Mus. Cat. No. 333517. It may take the varietal name of *dinea*.

TRIPHORA (STROBILIGERA) GAESONA, new species

Shell slender, white, acute, straight sided, except that the anterior edge of the whorls slightly overhangs the succeeding suture; protoconch white, smooth, swollen, comprising about 2 turns, with 16 or more subsequent whorls; spiral sculpture not prominent, including 2 flattish threads between the periphery and the succeeding suture with the peripheral edge of the base forming a simple thread at the suture; the incremental lines though very fine are rather evident, and there are very fine spiral striae in the interspaces; the whorls between the periphery and the preceding suture are slightly excavated; the base is flattish with flexuous incremental lines and a spiral groove near the outer edge, the canal is very short, with a callous deposit but no sulcus where the inner lip joins the body; the outer lip is defective in the specimen. Length of whole shell of 16 whorls, 9; maximum diameter, 1.8 mm. U. S. Nat. Mus. Cat. No. 108341.

Off Georgia; a worn but larger specimen measures 12 by 2 mm. without the protoconch.

TRIPHORA (STROBILIGERA) ENOPLA, new species

Shell slender, cylindrical, white, with an inflated protoconch of a whorl and a half and about 18 subsequent whorls; suture distinct, not channeled; spiral sculpture of 2 equal and equally spaced beaded cords with the prominent beads feebly linked in pairs by low axial ridges, not arranged in continuous series up the spire; other axial sculpture of faint incremental lines, more prominent on the moderately rounded base; on the base within the edge are 2 strong minutely crenulated spiral cords; aperture ovate, a rather heavy callus on the pillar, the sutural sulcus shallow and inconspicuous, the outer lip thin, the canal very short. Length, 11.5; maximum diameter, 2 mm. U. S. Nat. Mus. Cat. No. 108074.

Off Fernandina, six specimens and fragments.

The cylindrical form is very marked, as well as the prominence of the beads, of which on the penultimate whorl there are about 18.

TRIPHORA (STROBILIGERA) METEORA, new species

Shell small, slender, white, acute conical, with a conspicuously inflated smooth protoconch of 2 whorls and 12 subsequent whorls; suture obscure, rather oblique; spiral sculpture, on the earlier whorls of 2, later of 3 beaded cords, the posterior cord less prominent, the 2 anterior equal, the beads more or less linked in pairs by inconspicuous axial ridges, but not serially continuous up the spire; the beads are prominent, rather close-set and the interspaces very narrow; there are about 18 beads on the anterior cord of the penultimate whorl; the (immature) base is flattish with a fine groove just inside the edge,

and feebly marked by flexuous incremental lines; the canal is very short, the adult aperture defective. Length, 9; maximum diameter, 2 mm. U. S. Nat. Mus. Cat. No. 108081.

Off Fernandina, eight specimens.

The obliquity of the whorls and the much inflated protoconch are the most conspicuous features of this species.

**TRIPHORA (STROBILIGERA) COMPSA, new species**

Shell slender, white, conic, the nucleus deficient, with 12 remaining subsequent whorls; suture marked with a fine undulate thread which is the edge of the base; spiral sculpture of 2 prominent beaded cords, a carina running over the tops of the beads which are not axially paired, the interspaces between the cords forming a series of rounded pits; in front of the suture there is a very small, undulated thread, sometimes doubled; in addition there are microscopic spiral striae over the surface; the immature base is flattish, with flexuous radiating incremental lines, and a single sharp groove just inside the margin; the base in the adult is less flat, with four spiral flattened cords covering nearly the whole surface; the canal is short, the axis retains a purplish tint, the outer lip is defective. Length, 12; maximum diameter, 3.3 mm. U. S. Nat. Mus. Cat. No. 333518.

Off Georgia, two specimens.

**TRIPHORA (STROBILIGERA) SENTOMA, new species**

Shell elongate, subcylindrical, white, straight sided, the nucleus lost, 17 to 24 whorls remaining but still immature; spiral sculpture of 2 low flattened cords, faintly undulated, one at the periphery of the whorl, the other in front of it, the suture linear with a minute threadlet on each side of it, the interspaces shallow; axial sculpture of faint incremental lines; immature base flat with flexuous radiating lines and a shallow groove inside the outer edge; canal short. Length, about 28; maximum diameter, 3.5 mm. U. S. Nat. Mus. Cat. No. 108072.

Off Fernandina, two specimens and other fragments.

One of the fragments has a smooth protoconch of a whorl and a half. The total measurement of length is obtained by piecing together fragmentary specimens.

There are two or three other species indicated by specimens too imperfect to serve as a basis for formal description.

**Family CERITHIOPSIDAE**

**Genus CERITHIOPSIS Forbes and Hanley**

**CERITHIOPSIS GEORGIANA, new species**

Shell slender, acute with 4 subcylindrical smooth nuclear whorls, the last one merging gradually into the adult sculpture, which continues for about 14 moderately rounded whorls; suture distinct, not

deep; axial sculpture of (on the last whorl about 16) uniform vertical threads with subequal interspaces; the spiral sculpture consists of an undulate thread at the suture, and another at the margin of the base, and two stronger ones near the periphery; the intersections are not nodose; the reticulations are deep and square, the base is flattish with only flexuous incremental lines inside the marginal thread. Length, 7; diameter, 1.8 mm. U. S. Nat. Mus. Cat. No. 329358.

Off Georgia, eight specimens.

This is the only species of typical *Cerithiopsis* obtained from these dredgings, unless *C. eliza* be considered one.

Judging from its smooth styliform nucleus, the type of *Triforis* Deshayes (*T. plicata*) belongs in this family and not in the group to which *Triphora* Blainville is referred.

#### Subgenus LASKEYA Iredale

*Eumeta* MÖRCH, Faunula Moll. Islandiae, Vid. Medd., p. 208, 1868; sole example *Turritella costulata* Møller=*Eumeta arctica* Mörch. Not *Eumeta* Walker, 1855, Lepidoptera.

*Laskeya* IREDALE, Proc. Mal. Soc. London, vol. 13, p. 30, Aug., 1918.

This subgenus is characterized conchologically by its short blunt nucleus, as compared with the styliform nucleus of typical *Cerithiopsis*, and its strong axial ribbing. Fischer adds that the cusps of the uncini are finely denticulate.

The nucleus of the typical species is small and smooth, not exceeding one and a half whorls, and the succeeding nepionic whorl has extremely fine hair-like axial ribbing, followed by the adult sculpture.

The deep water forms described in this paper have a swollen nucleus, usually of greater diameter than the succeeding nepionic whorl, and the latter is usually axially ribbed, with or without spiral lines. While this peculiar nucleus is in my opinion the result of its deep-water environment (found in a great variety of genera from deep water) it seems not to occur in all the deep water *Cerithiopsides*, some of which retain the styliform nucleus, so it seems tentatively advisable to gather the groups with the swollen nuclei into a special section.

#### Section ONCHODIA Dall, 1924

##### LASKEYA (ONCHODIA) BENTHICA Dall †

Shell glassy white, with one swollen smooth nuclear whorl followed by one nepionic whorl with retractively angular small riblets with very fine spiral striae in the interspaces, succeeded by seven whorls with the adult sculpture; suture distinct, appressed, slightly constricted; axial sculpture of (on the last whorl 14) stout low, rounded ribs with

† See Proc. Biol. Soc. Wash., vol. 37, p. 89, Feb. 21, 1924. The present species is the type of the section.

subequal interspaces, somewhat obscured by the spiral sculpture; on the spire the spirals comprise two cords, the anterior stronger, forming at the intersections two rows of beads, the anterior row prominent and larger; there is also a fine simple thread at the margin of the base, in front of which the suture is laid and sometimes an intercalary thread at the periphery; the last whorl has three feeble cords becoming obsolete; the base convex with two or three simple spiral threads; aperture subquadrate, lip simple, the pillar very short and twisted, the canal short. Height, 6; diameter, 1.8 mm. U. S. Nat. Mus. Cat. No. 108344.

Off Georgia, many specimens.

**LASKEYA (ONCHODIA) MERIDA, new species**

Shell (not quite mature) with a swollen nuclear whorl, followed by a nepionic whorl with feeble, nearly vertical riblets, succeeded by 6 whorls with the adult sculpture; suture distinct; spiral sculpture of (on the early whorls 2, on the later 3) small cords, the peripheral stronger, all moderately nodulating the ribs, 2 fine simple threads at the edge of the moderately convex base, which later are covered in the suture; axial sculpture of (on the last whorl 17) slender slightly protractively oblique ribs with subequal or wider interspaces, cut by the spirals into subequal nodulations; aperture subquadrate, lip thin, pillar slender, short. Height, 3.6; diameter, 1.3 mm. U. S. Nat. Mus. Cat. No. 108075.

Off Fernandina, nine specimens.

**LASKEYA (ONCHODIA) SERINA, new species**

Shell not quite adult, white, with one swollen nuclear and one nepionic whorl, both somewhat worn, and seven subsequent whorls; general sculpture like that of *L. benthica* but more delicate, the ribs finer and more numerous, the suture more constricted; there is a fine crenulate thread at the edge of the flattish base, against which the suture is laid; the two peripheral spirals connected by the vertical ribs give the effect in profile of a flattish broad band encircling the whorls; aperture rounded, pillar short. Height, 4.5; diameter, 1.6 mm. U. S. Nat. Mus. Cat. No. 329380.

Off Georgia, five specimens; off Fernandina three specimens.

**LASKEYA (ONCHODIA) DOCATA, new species**

Shell very slender, with one swollen smooth nuclear and one nepionic whorl with feeble nearly vertical riblets, succeeded by 10 whorls with adult sculpture; suture constricted, appressed; last whorl with about 15 vertical ribs with subequal or wider interspaces; the early whorls have 2 peripheral spiral cords and a thread at the suture, later the thread becomes undulate and larger, and the last whorl has 4 spirals; the cords are stronger than the ribs, minutely nodose at the

intersections and with the ribs form a pretty regular reticulum; the cord near the somewhat convex base is undulate; the base is smooth and flattish, the canal very short, the aperture rounded. Height, 6; diameter, 1.3 mm. U. S. Nat. Mus. Cat. No. 108348.

Off Georgia, one specimen.

**LASKEYA (ONCHODIA) ARGENTEA, new species**

Shell small, silvery white, with one smooth swollen nuclear and one nepionic whorl with small arcuate riblets, succeeded by 10 rather flat-sided adult whorls; suture distinct, not constricted, a slight overhang to the preceding whorl; axial sculpture of (on the last whorl about 15) narrow, close-set, protractively oblique riblets; the periphery of the whorls is somewhat anterior; spiral sculpture of 3 small threads, the posterior thread less prominent, all minutely nodulous at the intersections; sculpture becoming obsolete on the last whorl; base smooth and rounded, canal short. Height, 5.5; diameter, 1.4 mm. U. S. Nat. Mus. Cat. No. 333474.

Off Georgia, 20 specimens.

A variety is more slender, with the ribs concavely arcuate. U. S. Nat. Mus. Cat. No. 333475; off Georgia, six specimens.

Another variety (?) from the same locality has the anterior spiral prominent, the sides of the whorl more flattish and sloping. U. S. Nat. Mus. Cat. No. 333476, one specimen.

**LASKEYA (ONCHODIA) DECORA, new species**

Shell small, whitish, with a small smooth nucleus and 1 nepionic whorl with small arcuate ribs, succeeded by 12 flattish whorls with adult sculpture; suture distinct, closely appressed, on a few of the late whorls the space in front of it is more or less excavated; on the early whorls are many feeble oblique riblets; these become gradually obsolete on the later whorls which show only incremental axial lines; spiral sculpture increases in strength with age, on the early whorls there are 2 on the later ones 3 subequal not very prominent spirals, beside a finer thread in front of the suture and 1 at the margin of the base; all more or less minutely crenulate; there are also some fine spiral striae in the interspaces; the base is flattish with flexuous incremental lines; aperture small, subquadrate; canal short, markedly recurved. Height, 7; diameter, 1.8 mm. U. S. Nat. Mus. Cat. No. 333477.

Off Georgia, two specimens.

The sculpture on this species is more condensed and finer than on either of the preceding species.

**LASKEYA (ONCHODIA) ALTHEA, new species**

Shell acute, elongate conic, shining white, with a smooth glassy nuclear whorl, the nepionic whorl with strong, slightly arcuate ribs,

followed by 9 whorls with adult sculpture; suture distinct, appressed, somewhat constricted; whorls convex; axial sculpture of numerous (on the last whorl 24) retractively arcuate narrow ribs with subequal interspaces; spiral sculpture of narrow threads, 1 at the suture, 2 near the periphery, and in the adult 2 at the margin of the base; the intersections are slightly angular, not nodulous; base smooth except for arcuate incremental lines, and a little concave; aperture squarish, lip thin, pillar thin, twisted, the edge obliquely attenuated, not prominent. Height, 8.5; diameter, 2.7 mm. U. S. Nat. Mus. Cat. 108077.

Off Fernandina, not rare.

**LASKEYA (ONCHODIA) ELIMA, new species**

Shell whitish, glossy, conic, with 1 low smooth swollen nuclear and 1 nepionic whorl with feeble axial ribbing, followed by about 8 whorls rather feebly sculptured, with the periphery nearer the succeeding suture; suture distinct, deeper between the later whorls, closely appressed; whorls moderately convex; axial sculpture of (on the last whorl about 20) narrow slightly arcuate low ribs with wider interspaces; also more or less obvious incremental lines continued in an arcuate manner over the smooth rounded base; spiral sculpture of 1 undulated thread near the suture, then a wide spirally finely striated space without threads, then 2 threads near the periphery, and 2 plain minor threads near the margin of the base, 1 of which appears on the spire behind the suture; the intersections are not nodulous, and the sculpture is more feeble on some specimens than on others; aperture rounded, lip thin, the pillar short, slender, twisted. Height, 7; diameter, 2.3 mm. U. S. Nat. Mus. Cat. No. 108349.

Off Georgia, six specimens.

**LASKEYA (ONCHODIA) ELSA, new species**

Shell small, slender, whitish, with 1 small smooth inflated nuclear and 2 nepionic whorls, the latter with 2 peripheral spirals crossed by numerous close fine axial threads, and succeeded by 8 moderately rounded whorls with adult sculpture; suture distinct; spiral sculpture of a small spiral cord at the suture, 2 near the periphery, and 1 at the edge of the base on which the suture is laid; axial sculpture of (on the last whorl 16) narrow riblets with wider interspaces, forming an open reticulum, not nodulous at the intersections; the base is smooth except for flexuous incremental lines; aperture rounded, lip thin, pillar short, attenuated in front; canal very short and recurved. Height, 4.7; diameter, 1.6 mm. U. S. Nat. Mus. No. 108347.

Off Georgia, five specimens.

The nucleus of this and the following species differs from most of the preceding forms in adding spiral threads to the sculpture of the nepionic part.

**LASKEYA (ONCHODIA) APICINA, new species**

Shell small, whitish, elongate conical, with a smooth nuclear whorl in which the apex is small and upturned, and the nepionic part with 1 feeble anterior spiral thread, a few fine spiral striae, and many slightly arcuate small axial riblets; there are 7 succeeding well-rounded whorls; suture distinct; axial sculpture of (on the last whorl 16) narrow vertical ribs with subequal interspaces, the incremental lines not obvious except on the base; spiral sculpture on the last whorl of 1 plain thread at the suture, next to it 2 stronger nodulose threads, then near the periphery 1 more strongly nodose, then a fine thread behind the succeeding suture, 1 of 2 of which the anterior is covered by the following whorl; the base is convex, with 2 threads at the margin and between them and the axis a smooth space; aperture rounded, lip thin, somewhat expanded; pillar very short, attenuated in front. Height 5.5; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 347852.

Off Georgia, two specimens.

**LASKEYA (ONCHODIA) HONORA, new species**

Shell small, slender, acute, with 2 glassy nuclear and 1 nepionic whorl carrying 2 spiral lines, followed by 11 whorls with adult sculpture; suture distinct, whorls flattish; spiral sculpture of a small undulate cord in front of the suture, 2 stronger nodulose cords near the periphery, and a plain thread at the margin of the base, which is covered by the suture; axial sculpture of (on the last whorl about 20) narrow ribs more or less hidden under the spirals and with narrower interspaces; base convex, smooth except for incremental lines; aperture rounded, the pillar slender, twisted; the canal short, recurved. Height, 7.5; diameter, 1 mm. U. S. Nat. Mus. No. 329360.

Off Georgia, one specimen.

**LASKEYA (ONCHODIA) ELIZA, new species**

Shell small, slender, whitish; with 2 smooth nuclear and 1 nepionic whorl, the latter gradually merging into the adult sculpture of the 7 succeeding well-rounded whorls; suture distinct, not deep; spiral sculpture of a small undulate thread at the suture, 2 stronger nodulose cords near the periphery, and a fine thread at the margin of the base which later is covered by the suture; axial sculpture of (on the last whorl about 12) obscure riblets with narrower interspaces, chiefly indicated by the nodules on the spiral cords; aperture defective, but apparently rounded, pillar slender, not markedly twisted, nearly straight. Height, 3.6; diameter, 1 mm. U. S. Nat. Mus. Cat. No. 108346.

Off Georgia, two specimens.

One of the specimens has two and the other only one smooth nuclear whorl, due perhaps to the longer persistence of the larval stage in the former.



**LASKEYA (ONCHODIA) PETALA, new species**

Shell small, slender, acute, whitish, with 1 glassy swollen nuclear whorl, and 1 nepionic whorl with fine vertical riblets with wider interspaces, succeeded by 12 flat-sided whorls with adult sculpture; suture closely appressed, inconspicuous; the sculpture consists of 3 minutely crenate spirals intersected by fine inconspicuous axial threads, not forming ribs; the sides of the spire are flattish, the base is only slightly convex, smooth except for flexuous incremental lines; the aperture is subquadrate, the pillar short and strongly twisted, the outer edge prominent like a plait. Height, 5; diameter, 1.1 mm. U. S. Nat. Mus. Cat. No. 108350.

Off Georgia, not uncommon.

The conspicuous edge of the twisted pillar is the most obvious character of this species. Some of the less perfect specimens are larger than the one serving as type.

**LASKEYA (ONCHODIA) LEIPHA, new species**

Shell small, slender, whitish, with a translucent white inflated nucleus of a whorl and a half, and 12 or more slightly convex subsequent whorls; suture distinct, slightly constricted; axial sculpture of (on the last whorl about 15) equal, nearly straight smooth riblets, with equal or slightly wider interspaces extending from suture to suture; spiral sculpture obscure, of numerous fine striae and on the later whorls two or three small threads, of which one on each side of the periphery is more prominent; base moderately rounded, smooth except for incremental lines, the margin almost carinate, while the ribs stop abruptly behind it; aperture rounded quadrate, canal short. Length of largest specimens 10; maximum diameter, 2 mm. U. S. Nat. Mus. Cat. No. 108360.

Off Georgia and Fernandina, about 20 specimens.

Except for its swollen and dextral nucleus, this species closely resembles a *Chemnitzia*.

**Subgenus STILUS Jeffreys**

*Stilus* JEFFREYS, Proc. Zool. Soc. London, for 1885, p. 52. Type *Stilus insignis* Jeffreys, Proc. Zool. Soc. London, for 1885, p. 52, pl. 6, figs. 1, 1a, 1b, 1885. North Atlantic.

The characteristic of this genus is the slender pointed apex of the larval whorl. It was regarded as a genus by Jeffreys but, as I find in *Laskeya apicina* a stage intermediate between typical *Stilus* and *Laskeya*, I have preferred to regard the group as subgeneric.

**STILUS VITREUS, new species**

Shell small, vitreous white, with an apical short upturned spur seated on a turban-shaped nepionic whorl, larger than the succeeding whorl, and sculptured with about 14 strong axial ribs; there are 9 well

rounded subsequent whorls with adult sculpture; suture deep, with a punctate appearance, due to the projecting ends of the ribs which are not continuous up the spire; axial sculpture of (on the last whorl 15) strong rounded ribs mostly with somewhat wider interspaces, crossing from suture to suture, but on the base only flexuous incremental lines; spiral sculpture of 2, or on the last whorl 3, fine rather feeble threads, widely separated, and fine almost microscopic striae with a single plain thread at the margin of the base, sometimes visible at the suture; aperture obovate; outer lip thin, not reflected, pillar straight, short, attenuated in front, canal very short, wide, not recurved. Height, 6.5; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 108337.

Off Georgia, numerous specimens, mostly worn. Off Fernandina, one young shell.

The typical species is flat-sided and has three spiral rows of sub-equal beads.

#### Genus CERITHIELLA Verrill

*Lovenella* G. O. Sars, Moll. Reg. Arct. Norv., p. 187, 1878; type *Cerithium metula* Lovén.—VERRILL, Amer. Journ. Sci., vol. 20, p. 396, Nov. 1880; Proc. U. S. Nat. Mus., vol. 3 p. 375, 1880. Not of Hincks, 1869.

*Cerithiella* VERRILL, Trans. Conn. Acad. Sci., vol. 5, p. 522, June, 1882; vol. 6, p. 270, 1884.

*Newtonia* COSSMANN, Annuaire Géol., vol. 8, p. 721, 1891; not *Newtonia* Schlegel, 1866; *Aves*.

*Newtoniella* COSSMANN, Ann. Soc. Roy. Malac. de Belgique, vol. 28, p. 18, 1893; not *Newtoniella* Cossmann, Ann. Soc. Roy. de Belgique for 1896, p. 29, 1899; type *Cerithium clavus* Lamarck.

*Cerithiella* IREDALE, Proc. Malac. Soc. London, vol. 9, p. 260, 1911.

The nucleus of the typical species is like that of *Laskeya*, the apical whorl is a little inflated, and the arcuate ribbing of the second or nepionic whorl is stronger.

*Cerithiella* and *Newtoniella* were based on the original type of *Lovenella*, hence the action of Cossmann in substituting a new type in 1899, can not be accepted.

Beside the original *C. metula* we know *C. whiteavesi* Verrill, and the following species.

#### CERITHIELLA PRODUCTA, new species

Shell slender, acute conic, translucent glossy white, with a somewhat defective but swollen nucleus, and ten subsequent, posteriorly sloping anteriorly rounded whorls; suture distinct, appressed, constricted; periphery of the whorls quite anterior; axial sculpture of (on the last whorl about 25) protractively oblique feeble ribs with narrower interspaces, more distinct on the early whorls and almost obsolete on the last whorl; incremental lines hardly noticeable except on the base; spiral sculpture of a fine line at the suture, a small thread a little in advance of the suture, 2 more prominent threads near the periphery,

and 2 others, less conspicuous, at the margin of the moderately rounded base; aperture rounded-quadrate, the outer lip thin, slightly protractively oblique; the pillar short and wide, slightly recurved. Height, 8.5; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 87305.

Off Fernandina, one specimen.

Genus *SEILA* A. Adams

*SEILA SUBALBIDA*, new species

Shell slender, flat-sided, white with pale brownish nebulosities, with 16 subcylindrical whorls exclusive of the (lost) nucleus; suture closely appressed, inconspicuous; axial sculpture only of incremental lines chiefly visible in the interspaces; spiral sculpture of 3 equal strong plain cords on the sides of the whorls, the first close to the suture, the second at the periphery, and the third between it and the succeeding suture; there are 2 feeble threads at the margin of the flattish base; aperture subquadrate, lips thin, the pillar twisted, short, with a prominent edge; canal short, axis minutely pervious. Height, 9; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 108070.

Off Fernandina, three specimens.

Family TRICHOTROPIDAE.

Genus *TRICHOTROPIS* Sowerby.

*TRICHOTROPIS (IPHINOPSIS) NUDA*, new species

Shell small, bucciniform, thin, translucent white, with about four roundly shouldered whorls; apex blunt, the suture distinct, not appressed; spiral sculpture of numerous, equally spaced, sharp striae with flattened wider interspaces covering the whole surface; axial sculpture of microscopically fine incremental lines; the last whorl more than three-fourths as long as the whole shell; base somewhat attenuated in front, with a deep narrow umbilicus with a hardly carinated margin; aperture semilunate, the margins thin, the outer lip rounded, the inner lip straight partly overshadowing the umbilicus; there is no indication of a canal. Length of shell, 6; of aperture, 3.5; diameter, 3.5mm. U. S. Nat. Mus. Cat. No. 107988.

Off Fernandina, three specimens.

This shell, though small, has the form of *Iphinoë* and the columella is entirely devoid of plaits. I suspect "*Admete*" *inflata* Friele, to belong to the same group. At all events the *Iphinoë kelseyi* Dall from off San Diego, Calif., certainly does. The small size, the absence of the hairy periostracum found in *Iphinoë*, and the deep water habitat of these small shells, indicate the propriety of separating them into a subgenus *Iphinopsis*<sup>5</sup> with *I. kelseyi* as type.

<sup>5</sup> See Proc. Biol. Soc. Wash., vol. 37, p. 88, Feb. 21, 1924.

**TRICHOTROPIS (IPHINOPSIS) TURRITA, new species**

Shell minute, slender, turreted, white, with five or more whorls, exclusive of the (lost) nucleus; suture very distinct, the whorls with a narrow angular shoulder; surface with faint incremental lines; whorls in front of the shoulder flattish; probably in fresh specimens with a fugacious periostracum; base acutely attenuated with a deep narrow umbilicus with a carinate margin; aperture subtriangular, with a narrow projection approaching a canal; margins of the aperture thin, simple, the pillar lip smooth and nearly straight. Length, 3; diameter, 1.5 mm.; length of the last whorl, 2 mm. U. S. Nat. Mus. Cat. No. 107986.

Off Fernandina, two specimens.

This species has much the same form in miniature as *T. borealis* Sowerby has on a larger scale.

**Family RISSOINIDAE****Genus RISSOINA Orbigny****RISSOINA MAYORI, new species**

Shell small, white, strongly sculptured, of about 6 moderately convex whorls; suture distinct, not deep; coronated by the blunt ends of the ribs; axial sculpture of (on the last whorl 16) strong rounded vertical ribs with narrower interspaces, crossing the whorls; the ribs are nearly in a continuous series up the spire; spiral sculpture of extremely fine, close, even striation covering the shell; base rounded aperture evenly ovate, the peristome simple, thickened, crossing the body by a bridge of callus. Length, 4; diameter, 1.8 mm. U. S. Nat. Mus. Cat. No. 108371.

Off Georgia, one specimen. Also off Miami, Fla., in 58 fathoms; Henderson. Named in honor of the late Dr. A. G. Mayor, of the Tortugas Biological Station.

**Family TRUNCATELLIDAE****Genus TRUNCATELLA Risso****TRUNCATELLA, species**

A broken specimen of this genus was found off Fernandina, doubtless washed in from the shore. U. S. Nat. Mus. Cat. No. 108050.

**Family RISSOIDAE****Genus RISSOA Freminville****RISSOA POMPHOLYX, new species**

Shell small, thin, fragile, white, with a glassy nucleus of about one, and nearly three subsequent well rounded whorls; suture distinct, deep; axial sculpture of a few minute wrinkles chiefly on the early

whorls and sometimes absent altogether, and more or less obvious incremental lines; spiral sculpture of extremely faint, almost microscopic striae over most of the surface; last whorl about half as long as the shell, inflated, and much the largest; base rounded; aperture ovate, peristome continuous, thin, sharp, a chink behind the inner lip. Length of shell, 2.5; diameter, 1.7 mm. U. S. Nat. Mus. Cat. No. 108314.

Off Georgia, five specimens.

Some of the specimens have a slightly brownish tint which may be accidental. The species is of a type recalling *R. coriacea* Manzoni, of Madeira.

### Section NODULUS Monterosato

#### RISSEO (NODULUS) FERNANDINAE, new species

Shell minute, subconic, white, with a blunt apex and about four and a half moderately rounded whorls; suture distinct, not deep; surface smooth, base evenly rounded with a shallow umbilical dimple; aperture rounded, the margin slightly thickened, the peristome not continuous across the body where it is represented by a thin layer of callus. Length, 1.6; diameter, 1.2 mm. U. S. Nat. Mus. Cat. No. 108224.

Off Fernandina, one specimen.

The shell recalls *R. nitida* Brusina, of the Mediterranean. The specimen may be bleached.

### Section CINGULINA Monterosato

#### RISSEO (CINGULINA) CURTA, new species

Shell minute, smooth, turbinate, white, of about three and a half moderately convex whorls; suture distinct, not deep; last whorl much the largest; base rounded, with a deep umbilical dimple; aperture rounded, the peristome thin, sharp, not continuous across the body. Height, 1.2; diameter, 1 mm. U. S. Nat. Mus. Cat. No. 333454.

Off Fernandina, one specimen.

It recalls *R. triangularis* Watson, from Ascension Island in 160 fathoms.

### Family CAPULIDAE

#### Genus CAPULUS Montfort

#### CAPULUS INTORTUS Lamarck

*Capulus intortus* LAMARCK, An. S. Vert., vol. 6, pt. 2, p. 18, 1822.—TRYON Man., vol. 8, p. 131, pl. 39, figs. 76-6, 1886.

Off Fernandina, one specimen.

## Family NATICIDAE

## EUSPIRA BAHAMENSIS, new species

Shell small, white, rather depressed, of three and a half well rounded whorls, the suture deep; surface smooth except for two or three spiral striae, directly in front of the suture and more or less obsolete on the later whorls; aperture ovate, narrow behind, outer lip sharp, inner lip nearly straight, not callous, but united by a layer of enamel over the body with the outer lip; umbilicus large, funicular. Altitude, 6.3; diameter, 8 mm. U. S. Nat. Mus. Cat. No. 107447.

Dredged by the United States Bureau of Fisheries at Station 2324, on the Great Bahama Bank in 33 fathoms.

This is nearly the size of *N. leptalea* Watson, but more depressed and with a much larger umbilicus.

## Family TURBINIDAE

## Genus LEPTOTHYRA (Carpenter) Pease

## LEPTOTHYRA INDUTA Watson

*Turbo (Collonia) indutus* WATSON, Journ. Linn. Soc., vol. 14, p. 715, 1879, *Challenger* Rep., Gastr., p. 128, pl. 6, fig. 1, 1885.

*Leptothyra (induta* var.) *albida* DALL, Bull. Mus. Comp. Zool., vol. 9, p. 48, 1881; vol. 18, p. 352, pl. 38, fig. 6, 1889.

*Leptothyra induta* DALL, in Agassiz, Three cruises of the *Blake*, vol. 2, p. 69, fig. 287, 1888.

Off Georgia and Fernandina, four specimens; thence through the Antilles and Yucatan Strait, in 152 to 640 fathoms.

## Family TROCHIDAE

## Genus SOLARIELLA Wood

## SOLARIELLA CANCELLA, new species

Shell minute, conical, white, with a very small smooth nucleus and about five well rounded whorls; suture distinct, not deep; spiral sculpture of (on the penultimate whorl four, on the last whorl six) subequal threads with narrower interspaces evenly spread over the whorl between the sutures; axial sculpture of numerous oblique similar threads with narrower interspaces forming above the base with the spirals a dense reticulation; base rounded with similar spirals but the axials obsolete; aperture subcircular, the pillar lip thickened, concavely arcuate, with a minute chink behind it, the remainder of the margin thin, simple, hardly pearlaceous. Height, 3.5; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 108120.

Off Fernandina and Georgia, 46 specimens.

There is some difference in proportions among the specimens, most of which are young, some being more slender than others.

**SOLARIELLA CROSSATA, new species**

Shell small, brilliantly polished, white, thin, with a bulbous sub-spherical smooth nucleus and about four subsequent whorls; suture distinct, the whorl in front of it depressed; axial sculpture of numerous equal and equally spaced plications radiating straightly from the axis but hardly reaching the periphery; these become more feeble toward the end of the last whorl; the incremental lines are delicate and silky; spiral sculpture of fine equal striation covering the whole surface, more or less strong in different individuals; around the rather wide funicular umbilicus is a strong more or less beaded cord with one or two conspicuous grooves outside of it; walls of the umbilicus finely spirally striated; aperture nearly circular, the margins thin, sharp; internally nacreous. Height of shell, 2.2; diameter, 4.2 mm. U. S. Nat. Mus. Cat. No. 87358.

Dredge by the United States Bureau of Fisheries steamer *Albatross* off Fernandina, Fla., in 294 fathoms sand, at Station 2668, the bottom temperature, 46.3° F.

This is somewhat like *S. actinophora* but smaller and less elevated, with feebler spirals.

**SOLARIELLA AEGLEIS Watson.**

*Margarita aegleis* WATSON, Journ. Linn. Soc., vol. 14, p. 704, 1879; *Challenger* Rep., Gastr., p. 81, pl. 5, fig. 10, 1885.

*Solariella aegleis* DALL, Bull. Mus. Comp. Zool., vol. 18, p. 379, 1889.

Off Fernandina, one specimen.

**Genus EUCHELUS Philippi****EUCHELUS EUCASTA Dall**

*Euchelus eucasta* DALL, Bull. U. S. Nat. Mus., No. 37, p. 164, 1889.

Shell small, trochiform, snow white, with a minute depressed glassy nucleus of about 1 whorl and 5 subsequent whorls; suture distinct, not deep; whorls only moderately convex, spiral sculpture of (on the penultimate whorl 5, on the base 5) prominent equal and equally distributed threads with subequal interspaces; axial sculpture of (on the last whorl about 40) retractively oblique threads about as strong as the spiral, equal and equally distributed, extending over the whorls and nodulous at the intersections, forming a very regular reticulum; base rounded, imperforate; aperture oblique, rounded, the outer lip simple, with 2 prominent posterior and several feeble lirations internally; pillar lip short with 2 projecting denticles at its anterior part; throat pearly. Height of shell, 6.5; of last whorl, 4.5; diameter, 5.3 mm. U. S. Nat. Mus. Cat. No. 93793.

Off Georgia, two specimens.

The extreme regularity of the reticulation is the most striking peculiarity of this species.

## Family VITRINELLIDAE

## Genus VITRINELLA C. B. Adams

## VITRINELLA GEORGIANA, new species

Shell minute, glassy white, low turbiniform, with about three and a half smooth, well-rounded whorls; nucleus minute, suture distinct, not deep; aperture subcircular, the peristome interrupted by the body whorl, not reflected, sharp; base roundly convex, with a minute perforate umbilicus, partly shadowed by the inner lip. Height 1.6; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 329375.

Seven specimens of different ages were obtained off Georgia.

## Genus BASILISSA Watson

## Subgenus ANCISTROBASIS Dall

*Ancistrobasis* DALL, Bull. Mus. Comp. Zool., vol. 18, p. 383, 1889. Type *Basilissa costulata* Watson, Dall, Bull. Mus. Comp. Zool., vol. 18, pl. 23, figs. 4, 4a., 1889.

## ANCISTROBASIS COSTULATA Watson.

*Basilissa costulata* WATSON, Journ. Linn. Soc., vol. 14, p. 600, April, 1870; Challenger Rep., Gastr., p. 103, pl. 7, figs. 11, 11a., 1886.

Off Georgia, four specimens. Yucatan Strait in 640 fathoms; and Sand Key, in 15 fathoms, *Blake* expedition; off Culebra Island, West Indies, in 390 fathoms, pteropod ooze, *Challenger* expedition.

Watson's figure is inaccurate in showing the edge of the whorl rounded, while his description says "sharply angulated." The figure in the Bulletin of the Museum of Comparative Zoölogy (vol. 18, pl. 23, figure 4a.), is accurate.

## Subgenus BASILISSA s. s.

## BASILISSA WATSONI, new species

*Basilissa superba* WATSON (young), Dall, Mus. Comp. Zool., vol. 18, p. 384, 1889.

Shell small (immature?), white, flatly conical, with a glassy minute nucleus of one whorl and seven subsequent whorls; suture closely appressed, not impressed; whorls above the base flat; axial sculpture of many protractively flexuous extremely fine lines with wider interspaces over all the whorls; the cemented edges at the suture by their opacity look like a presutural band, but this is not reflected in the sculpture; spiral sculpture on the spire of almost microscopic close striae; on the base there are about a dozen fine spiral grooves between the edge of the umbilicus and the periphery, a little coarser near the carina; base nearly flat, sharply carinate at the periphery; the umbilicus funicular, deep, the verge carinate; aperture quadrate, slightly oblique, the margin thin, sharp, simple. Height of shell, 4; of last whorl, 2; diameter, 5 mm. U. S. Nat. Mus. Cat. No. 94940.



The locality of this species, dredged by the *Albatross* off the southeastern coast, was not preserved; it may very probably have been off the coast of Georgia. It was hastily referred to the young of *B. superba* Watson, an Australian shell, but closer study shows its distinctness, as the geographical position rendered probable. The most obvious differences are the simple carinations of the whorl and the margin of the umbilicus, which in the Australian species are beaded. The sculpture of the spire is similar in both.

## Family COCCULINIDAE

### Genus COCCULINA Dall

#### COCCULINA LISSOCONA, new species

Shell small, white, conic, with the apex well recurved and slightly behind the middle of the shell; surface smooth, aperture oval, margin entire; interior porcellaneous white. Height, 1.5; length, 2.5; width, 1.7 mm. U. S. Nat. Mus. Cat. No. 333472.

Off Fernandina, 13 specimens. At many localities along the Florida coast and keys, in from 63 to 135 fathoms; J. B. Henderson, jr.

This is the first perfectly smooth species I find among those referred to this genus.

## Family SCISSURELLIDAE

### Genus SCISSURELLA Orbigny, 1823

#### SCISSURELLA CRISPATA Fleming

*Scissurella crispata* FLEMING, Brit. Animals, p. 366, 1828.—FORBES and HANLEY, Brit. Moll., vol. 2, p. 544, pl. 63, fig. 6, 1853.

Off Fernandina, two specimens.

#### SCISSURELLA PROXIMA, new species

Shell minute, white, of nearly four whorls, the slit about one-fourth as long as the whorl; the suture distinct, not deep; the posterior surface between the suture and the fasciole arcuately striated; the base moderately convex, the surface nearly smooth, but under the lens showing a faint reticulation of the incremental lines with faint spiral threads; umbilicus perforate; the aperture rounded; the pillar lip slightly reflected. Height, 1.7; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 322962.

Dredged off South Carolina by the United States Bureau of Fisheries Steamer *Albatross* at Station 2314, in 159 fathoms coarse sand, bottom temperature 47.4° F.

The species is smaller and relatively more elevated than *S. crispata*; less elevated and with much less prominent sculpture than *S. alta* Watson, especially on the base. It has been collected in 434 fathoms off St. Augustine, and in numerous other localities on the coast and off the keys of Florida, in 20 to 200 fathoms.

## Family FISSURELLIDAE

## Genus DIADORA Gray

## DIADORA BERMUDENSIS Dall and Bartsch

*Fissuridea bermudensis* DALL and BARTSCH, Proc. U. S. Nat. Mus., vol. 40, No. 1020, p. 286, pl. 35, fig. 8, 1911.

Off Georgia, one dilapidated specimen probably of this species and doubtless derived from shallow water. U. S. Nat. Mus. Cat. No. 108284.

## Genus PUNCTURELLA Lowe

## PUNCTURELLA PROFUNDI Jeffreys

*Puncturella profunda* JEFFREYS, Proc. Zool. Soc., London, for 1882, p. 675, pl. 50, fig. 10.

Off Fernandina and Georgia, 19 specimens. Bay of Biscay in 1,003 to 1,450 fathoms, *Travailleur* expedition. Off Culebra Island, West Indies, in 390 fathoms, *Challenger* expedition.

The Florida shells appear from the original figure and specimens in the Jeffreys collection to be typical. A variety occurs in which the radial sculpture alternates stronger and weaker and is more or less granulated by incremental lines, which may take the name of *multifila*.

## PUNCTURELLA OXIA Watson

*Puncturella oxia* WATSON, Journ. Linn. Soc., vol. 17, p. 36, 1883; *Challenger* Rep., Gastr., p. 44, pl. 4, fig. 8, 1886.

Shell minute, conical, white, ovate, the anterior slope somewhat convex, the posterior concave, the foramen nearly central, large for the size of the shell, the nuclear whorl not persistent, the internal septum nearly vertical; sculpture of divaricate and obliquely reticulate crowded rows of granules, those on the sides divaricating from the middle line of the side; margin entire, the interior smooth. Length of shell, 3.2; breadth, 2.4; height, 1.5 mm. U. S. Nat. Mus. Cat. No. 108286.

Off Fernandina and Georgia, two specimens. Off Culebra Island, West Indies, in 390 fathoms, *Challenger* expedition.

The sculpture is quite remarkable.

## PUNCTURELLA HENDERSONI, new species

Shell elevated, dingy white with a dextrally incurved apex and a rather long narrow slit extending about one-third of the way to the base; vertical sculpture of about 48 narrow ribs with much wider interspaces and occasional smaller intercalary riblets; the former crenulating the margin; concentric sculpture of uniform fine conspicuous threads with narrower interspaces covering the whole shell and minutely crenulating the vertical sculpture. Height, 9; length, 10.2; breadth, 8 mm. U. S. Nat. Mus. Cat. No. 333471.

Off Georgia, one specimen. Off the Sambo reef, Florida Strait in, 120 fathoms; J. B. Henderson, jr.

This elegantly sculptured species is one of the most attractive of the genus.

**PUNCTURELLA CIRCULARIS** Dall

*Puncturella circularis* DALL, Bull. Mus. Comp. Zoöl., vol. 9, p. 75, 1881; vol. 18, p. 408, pl. 26, figs. 7, 7b., 1889.

Shell small, thin, whitish, conical, the anterior slope nearly straight, the posterior slope and sides more or less concave, the foramen nearly central, the nuclear shell persistent, the internal septum triangular, vertical; concentric sculpture of faint incremental lines; radial sculpture of fine granular threads with much wider flattish interspaces; margin faintly crenulate by the ends of the radials; interior polished. Length of shell, 4.5; breadth, 4; altitude 3.1 mm. U. S. Nat. Mus. Cat. No. 108152a.

Off Fernandina, one specimen. Blake Station 44, in 539 fathoms, northwest of the Dry Tortugas, temperature 39.5° F. East of Tobago, in 880 fathoms, temperature, 38° F., United States Bureau of Fisheries.

**PUNCTURELLA TENUICULA**, new species

Shell minute, thin, white, the anterior slope nearly straight, the posterior somewhat concave and a little longer; the foramen large for the size of the shell, the internal septum vertical, the nuclear whorl not persistent; sculpture of almost microscopic radial granulations and feeble concentric incremental lines; margin entire, ovate. Length, 3; breadth, 2.2; height, 1.6 mm. U. S. Nat. Mus. Cat. No. 108151.

Off Fernandina, one specimen.

This is intermediate in character between *Puncturella* and *Fissurisepta*.

Subgenus **CRANOPSIS** A. Adams

**PUNCTURELLA (CRANOPSIS) ASTURIANA** Fischer

*Rimula asturiana* FISCHER, Journ. de Conchyl., vol. 30, p. 51, 1882.—WATSON, Challenger Rept. Gastr., p. 45, pl. 4, fig. 4, 1885.—DALL, Bull. Mus. Comp. Zoöl., vol. 18, p. 404, 1889.

Off Fernandina and Georgia, three fine specimens. Gulf of Gascony, *Travailleur* expedition. Off Cape Florida, in 85 fathoms. Yucatan Strait and eastward to Martinique, in 213 to 640 fathoms.

Genus **FISSURISEPTA** Seguenza

**FISSURISEPTA TRIANGULATA** Dall

*Fissurisepta triangulata* DALL, Bull. Mus. Comp. Zoöl., vol. 18, p. 404, 1889. *Puncturella rostrata* WATSON (not Seguenza), Challenger Gastr., p. 48, pl. 4, fig. 10, 1885.

Shell small, thin, white, elevated, with a small recurved apex, the anterior slope convexly arcuate, the posterior shorter and somewhat concave; the foramen circular, small; the internal septum obliquely set, with no indication of a nuclear whorl; sculpture of more or less divaricate quincuncially arranged conspicuous granules on a smooth polished surface; margin entire, ovate, interior polished. Length, 3; breadth, 2.5; height, 4 mm. U. S. Nat. Mus. Cat. No. 108153.

Off Fernandina, eight specimens. Coast of Yucatan, 200 fathoms; United States Bureau of Fisheries. Off Culebra Island, in 390 fathoms, *Challenger* expedition. Bay of Campeachy, 200 fathoms; Henderson.

The Fernandina specimens are somewhat more slender than those from Yucatan.

#### Genus EMARGINULA Lamarck

##### Subgenus RIMULA Defrance

##### EMARGINULA (RIMULA) LARVA, new species

Shell minute, long-ovate, white, with a glassy beadlike nucleus and an enrollment of about one whorl; the apex nearly terminal at the posterior end; anterior slope convexly arched, slit about half as long as the shell, narrower in front, the scar extending backward the whole length of the shell; sculpture of more or less crowded fine granulate radial lines with lines of granules in the interspaces; margin entire, interior polished, the scar of the slit appearing as a rounded ridge; the nucleus is a little prominent on the right side of the spire. Length, 3; breadth, 2.3; height, 1 mm. U. S. Nat. Mus. Cat. No. 108148.

Off Fernandina, 3 specimens.

##### Subgenus EMARGINULA s.s.

##### EMARGINULA CANCELLATA Philippi

*Emarginula cancellata* PHILIPPI, Moll. Sicil., vol. 1, p. 114, pl. 5, fig. 15, 1840.—DALL, Bull. Mus. Comp. Zool., vol. 18, p. 406, 1889.

Off Fernandina, four broken specimens, apparently of this species. Mediterranean, Philippi. Off Cuba in 127 to 287 fathoms. Off Barbados, in 100 fathoms; *Blake* expedition.

##### EMARGINULA COMPRESSA Cantraine

*Emarginula compressa* CANTRAINE, Bull. Acad. Roy. de Bruxelles, vol. 9, p. 2, 1881.—JEFFREYS, Proc. Zool. Soc. London, for 1882, p. 679, 1883.—DALL, Bull. Mus. Comp. Zool., vol. 18, p. 406, 1889.

Off Georgia, two fine specimens of this species. Coast of Portugal and the Mediterranean. Yucatan Strait and eastward to the Lesser Antilles, in 81 to 640 fathoms.

## Family BATHYSCIADIIDAE

## Genus BATHYSCIADIUM Dautzenberg and Fischer

## ? BATHYSCIADIUM CONCENTRICUM, new species

Shell minute, yellowish white, conic, circular at the margin, the apex central, the sides slightly convex, sculptured with obvious concentric lines; there is no other sculpture; the margin is simple, the interior polished; height, 1.2; diameter, 2.5; length, 2.5 mm. U. S. Nat. Mus. Cat. No. 329353.

Off Georgia, one specimen.

This little shell has the shape and aspect of a *Bathysciadium*, though there is no radial sculpture and in the absence of the soft parts it is not possible to be certain of the genus.

## Family SIPHONARIIDAE

## Genus WILLIAMIA Monterosato

## WILLIAMIA, species

A young specimen of this pelagic *Siphonaria* was obtained off Georgia, but too immature for specific identification. It lives on floating seaweed and reaches the sea bottom only after death.

## Family ISCHNOCHITONIDAE

## Genus ISCHNOCHITON Gray

## ISCHNOCHITON STRIOLATUS Gray

*Chiton striolatus* GRAY, Spicil. Zoöl., p. 6, 1828.—REEVE, Conch. Icon., *Chiton*, pl. 22, fig. 144, 1847.

*Chiton squamulosus* C. B. ADAMS, Proc. Boston Soc. Nat. Hist., vol. 2, p. 8, 1845.

*Ischnochiton striolatus* PILSBRY, Tryon, Man. Conch., vol. 14, p. 105, pl. 20, figs. 20-24, 1892.

Off Fernandina, three separated valves (U. S. Nat. Mus. Cat. No. 108159) which appear to belong to this species. St. Thomas, Barbados, and Jamaica, according to Pilsbry.

## SUPPLEMENT

Part of the material having been mislaid and not recovered until the remainder of the manuscript was in type, it has obliged the writer to bring in this portion as a supplementary item. Circumstances have unfortunately deferred illustration of the new species.

Including these additions the total number of species obtained from the two dredgings, omitting pelagic forms, is 400. This includes 5 species of Brachiopoda, 41 Pelecypoda, 14 Scaphopoda, and 340 Gastropoda. Of these 93 species were found at both stations, 196 only off Fernandina, and 98 only off Georgia.

Out of the whole number of species collected (400) 240 appear to be new, including the 6 scaphopods described by Mr. J. B. Henderson, jr.

The following species appear in this supplement:

- |   |   |
|---|---|
| <i>Iphitus tuberatus</i> Jeffreys.        | <i>Ganesa (Lissospira) depressa</i> Dall. |
| <i>Iphitus reticulatus</i> Dall.          | <i>Ganesa (Lissospira) valvata</i> Dall.  |
| <i>Architectonica bisulcata</i> Orbigny.  | <i>Granigyra limata</i> Dall.             |
| <i>Rissoa xanthias</i> Watson.            | <i>Granigyra radiata</i> Dall.            |
| <i>Rissoa syngenes</i> Verrill.           | <i>Lydiaphnis trilix</i> Bush.            |
| <i>Rissoa listera</i> Dall.               | <i>Lydiaphnis translucens</i> Dall.       |
| <i>Rissoa (Cingula) campa</i> Dall.       | <i>Lydiaphnis hendersoni</i> Dall.        |
| <i>Rissoa (Cingula) canonica</i> Dall.    | <i>Lydiaphnis margaritifformis</i> Dall.  |
| <i>Rissoa (Cingula) lampra</i> Dall.      | <i>Vitrinella carinifex</i> Dall.         |
| <i>Benthonella nisonis</i> Dall.          | <i>Vitrinella massarita</i> Dall.         |
| <i>Benthonella gaze</i> Dall.             | <i>Vitrinella cerion</i> Dall.            |
| <i>Litiopa bombyx</i> Rang.               | <i>Vitrinella rhyssa</i> Dall.            |
| <i>Litiopa striata</i> Pfeiffer.          | <i>Pseudorotella solida</i> Dall.         |
| <i>Litiopa basistriata</i> Dall.          | <i>Pseudorotella floridensis</i> Dall.    |
| <i>Alba conoidea</i> Dall.                | <i>Calliostoma benedicti</i> Dall.        |
| <i>Polinices leptalea</i> Watson.         | <i>Calliostoma hendersoni</i> Dall.       |
| <i>Polinices nana</i> Moller.             | <i>Calliostoma tittarium</i> Dall.        |
| <i>Cryptonatica pusilla</i> Say.          | <i>Calliostoma halibrectum</i> Dall.      |
| <i>Lamellaria fernandinae</i> Dall.       | <i>Calliostoma arestum</i> Dall.          |
| <i>Sinum</i> , species.                   | <i>Calliostoma trachystum</i> Dall.       |
| <i>Megalomphalus caro</i> Dall.           | <i>Calliostoma kampsia</i> Dall.          |
| <i>Vetulonia josephinae</i> Jeffreys      | <i>Solariella calatha</i> Dall.           |
| <i>Vetulonia densilirata</i> Dall.        | <i>Solariella anoxia</i> Dall.            |
| <i>Mollerioptis sincera</i> Dall.         | <i>Solariella tubula</i> Dall.            |
| <i>Cocculina reticulata</i> Verrill.      | <i>Solariella tubulata</i> Dall.          |
| <i>Cocculina georgiana</i> Dall.          | <i>Solariella tiara</i> Watson.           |
| <i>Cocculina rotunda</i> Dall.            | <i>Micropiliscus constrictus</i> Dall.    |
| <i>Basilissa rhyssa</i> Dall.             | <i>Margarites minona</i> Dall.            |
| <i>Ganesa (Lissospira) proxima</i> Tryon. | <i>Dillwynella modesta</i> Dall.          |
| <i>Ganesa (Lissospira) buseae</i> Dall.   | <i>Lippistes planorbis</i> Dall.          |
| <i>Ganesa (Lissospira) conica</i> Dall.   | Nepionic shell of gastropod.              |

**Genus IPHITUS Jeffreys, 1883****IPHITUS TUBERATUS Jeffreys**

*Iphitus tuberatus* JEFFREYS, Proc. Zool. Soc. London, for 1883, p. 114, pl. 20, fig. 12.

Off Georgia and Fernandina, rare and immature.

**IPHITUS RETICULATUS, new species**

Shell conic, white, with a brown styliform nucleus of three and one-half subcylindrical whorls and about five subsequent moderately rounded whorls; suture distinct, not deep; spiral sculpture forming with the axial a very regular reticulum, the spirals flat; on the penultimate whorl five, the posterior smaller than the others; on the last whorl six, the anterior forming a carinate border to the base, in front of which on the flattish base are six smaller spirals; axial sculpture of (on the last whorl about 20) retractorily oblique equal and equally distributed flattish cords, with obvious incremental lines in the interstices; the base is imperforate, the aperture strongly recalls that of *Trichotropis*. Height, 5.5; major diameter, 2.7 mm. U. S. Nat. Mus. Cat. No. 108315.

Two specimens off Georgia.

The sculpture of this species is entirely different from that of Jeffreys's type.

**Genus ARCHITECTONICA Bolten, 1798****ARCHITECTONIA BISULCATA Orbigny**

*Solarium bisulcatum* ORBIGNY, Moll. Cuba, vol. 2, p. 66, pl. 19, figs. 17, 20, 1845.

*Solarium boreale* VERRILL and SMITH, Trans. Connecticut Acad. Sci., vol. 5, p. 529, pl. 57, figs. 29, 30, 1882; Proc. U. S. Nat. Mus., vol. 3, p. 376; 1880.

Off Georgia, 19, and off Fernandina, 6 specimens. Also off Cape Cod in 55 fathoms, and off Marthas Vineyard in 115 fathoms, United States Fish Commission, Cuba, Orbigny.

**Genus RISSOA Fréminville****RISSEO XANTHIAS Watson**

*Rissoa xanthias* WATSON, Challenger Gastr., p. 588, pl. 44, fig. 5, 1886.—DALL, Blake Rept., p. 288, pl. 19, fig. 10, 1889.

Off Georgia and Fernandina, numerous. Off Culebra Island, West Indies, in 390 fathoms, and off Pernambuco, Brazil, in 350 fathoms, *Challenger* expedition.

The graduations between the typical form and the variety *acuticostata* Dall (1889) are so easy that it is practically impossible to fix a limit.

## RISOA SYNGENES Verrill

*Cingula syngenes* VERRILL, Trans. Connecticut Acad. Sci., vol. 6, p. 280, pl. 32, fig. 11, 1884.

Off Fernandina, numerous. Off Cape Hatteras, N. C., in 142 fathoms, United States Fish Commission.

## RISOA LISTERA, new species

Shell small, translucent white, glistening, with three yellowish nuclear whorls and three subsequent, well-rounded whorls; suture distinct, not deep; axial sculpture of more or less obsolete vertical wrinkles stronger on the spire, not passing the periphery of the whorl, and faint incremental lines; spiral sculpture of fine even striae, stronger on the base, covering the whorl; base imperforate, aperture obovate, the margin simple, not connected across the body. Height, 3 mm.; diameter, 1.5 mm. U. S. Nat. Mus. Cat. No. 333787.

Off Fernandina, six specimens.

This species groups with *R. xanthias* but is smaller, with translucent shell, feeble sculpture, and without a shoulder to the whorls.

## Subgenus CINGULA Fleming

## RISOA (CINGULA) CAMPTA, new species

Shell small, translucent white, slender, with a glassy nucleus of about two whorls and four subsequent well-rounded whorls, separated by a deep suture; axial sculpture of numerous minute close-set vertical riblets, hardly visible without a lens, crossed by microscopic spiral striae over the whole surface; base rounded, imperforate, the lips simple, not meeting over the body. Height, 3.6 mm.; diameter, 1.5 mm. U. S. Nat. Mus. Cat. No. 108403.

Off Georgia, numerous, mostly stained brown by manganese.

## RISOA (CINGULA) CANONICA, new species

Shell small, smooth, opaque, white, with four well-rounded whorls, including a smooth, not differentiated, nucleus and separated by a well-marked but not deep suture; sculpture only of more or less feeble incremental lines; base evenly rounded, imperforate; aperture subovate, not oblique, the margin simple, slightly thickened, not complete in the young but in the adult united by enamel over the body. Height, 2.5; diameter, 1.4 mm. U. S. Nat. Mus. Cat. No. 108094.

Off Fernandina, numerous.

It is possible that perfectly fresh specimens may be less opaque than those here examined.



## RISSOA (CINGULA) LAMPRA, new species

Shell about the size of *R. campia* but with a more drawn out last whorl and less constricted suture; white, acute, with a small, somewhat irregular glassy nuclear whorl and five subsequent neatly rounded whorls; axial sculpture of numerous fine, thread like nearly vertical riblets crossing the early whorls and reaching near the periphery on the last whorl; they are more or less evident on different specimens; spiral sculpture of five even faint striae, covering the whole surface; base rounded, imperforate; aperture ovate, not oblique, margin simple, thin, united over the body in the adult by a thin layer of enamel. Height, 3.6 mm.; diameter, 1.6 mm. U. S. Nat. Mus. Cat. No. 108096.

Off Fernandina, numerous.

## Genus BENTHONELLA Dall, 1889

## BENTHONELLA NISONIS Dall

*Benthonella nisonis* DALL, Bull. Mus. Comp. Zool., vol. 18, p. 283, 1889.

Off Fernandina, five specimens and fragments. Gulf of Mexico, in 940 fathoms, United States Fish Commission.

## BENTHONELLA GAZA Dall

*Benthonella gaza* DALL, Bull. Mus. Comp. Zool., vol. 18, p. 282, 1889.

Off Fernandina and Georgia, abundant. South to the vicinity of Ceara, Brazil, in 1,019 fathoms, United States Fish Commission.

This is the type of the genus. Jeffreys named the genus *Hela*, basing it upon another North Atlantic species, but that name was preoccupied.

## Genus LITIOPA Rang, 1829

## LITIOPA BOMBYX Rang

*Litiopa bombyx* RANG, Annales Sci. Nat., p. 303, 1829.—TRYON, Manual Conchology, vol. 9, p. 281, pl. 53, fig. 74, 1887.

Off Fernandina, not rare.

This is of course a pelagic floating species. The specimens agree with Tryon's figure but are only about 4 millimeters long. They are quite smooth under a lens.

## LITIOPA STRIATA Pfeiffer

*Litiopa striata* PFEIFFER, Archiv für Naturg., vol. 1, p. 255, 1840.—TRYON, Manual Conchology, vol. 9, p. 281, pl. 53, fig. 72, 1887.

Off Fernandina, one specimen.

This form is evenly totally spirally striate.

## LITIOPA BASISTRIATA, new species

Shell (originally pale brown?) white or translucent as dredged, brilliantly polished, with a minute brown, reticulate, subcylindrical nucleus of two or three whorls and about four subsequent rather rapidly enlarging whorls; base with 10 or more sharply cut striae with much wider interspaces; aperture rather narrowly ovate, the outer lip thin, the pillar shorter than the aperture with a prominently reflected anterior edge; the body with a thin wash of callus. Height, 5.7 mm.; diameter, 2.3 mm. U. S. Nat. Mus. Cat. No. 108406.

Off Georgia, abundant.

The spiral striae rarely reach the periphery.

## Genus ALABA A. Adams

## ALABA CONOIDEA Dall

*Alaba conoidea* DALL, Proc. U. S. Nat. Mus., vol. 12, p. 336, 1889.

Off Georgia and Fernandina, abundant. Also on the Campeche Bank, in 200 fathoms, Dr. W. H. Rush; and off Cape Hatteras, in 63 fathoms.

## Genus POLINICES Montfort

## POLINICES NANA Møller

*Natica nana* MøLLER, Kroyer's Natur. Tidssk., vol. 4, p. 80, 1842.

*Lunatia nana* VERRILL, Trans. Conn. Acad. Sci., vol. 5, p. 516, pl. 42, fig. 9, 1882.

A dozen specimens off Fernandina. The species ranges north to Greenland.

## POLINICES LEPTALEA Watson

*Natica leptalea* WATSON, Journ. Linn. Soc. London, vol. 15 (Zoology), p. 261, 1880; Challenger Gastr., p. 441, pl. 27, fig. 7, 1889.

Numerous specimens off Fernandina. Off Sombrero Island in 450 fathoms; Watson.

## NATICA (CRYPTONATICA) PUSILLA Say

*Natica pusilla* SAY, Journ. Acad. Nat. Sci. Phila., vol. 2, p. 257, 1822.—TRYON, Marine Moll. Atlantic Coast, p. 58, fig. 95, 1873.

One fresh specimen was obtained off Georgia.

## LAMELLARIA FERNANDINIAE, new species

Shell very small, naticoid, translucent white, of two and one-half whorls; suture pronounced, not channeled; sculpture of incremental lines, occasionally strongly impressed; aperture large, the pillar retractively arcuate, not reflected; axis imperforate. Height, 3 mm.; diameter 3.2 mm. U. S. Nat. Mus. Cat. No. 108110.

One living specimen off Fernandina.

This is much more naticoid in form than *L. pellucida* Verrill, and much smaller than *L. rangi* Bergh.

**SINUM, sp. indet.**

The apical fragment of a species of *Sinum* was obtained off Fernandina. The surface is smooth, and it is probably the young of one of the known species. U. S. Nat. Mus. Cat. No. 108110.

**Genus MEGALOMPHALUS Brusina, 1871**

*Macromphalina* COSSMANN, 1888; *Adeorbis*, species JEFFREYS, 1885; *Fossarus*, species SEGUENZA, 1874; *Gyrodisca* DALL, 1895.

**MEGALOMPHALUS CARO, new species**

Shell minute, whitish, of about two and one-half well-rounded whorls; nucleus minute, glassy; suture deep, not channeled; axial sculpture of rather obvious incremental lines; spiral sculpture of three or more rather sharp grooves near and in front of the periphery; base widely funicular; aperture oblique, wide, the margins thin, simple; a thin film of callus over the body; the periphery of the basal funicle almost carinate, the axis perforate minutely. Height, 1 mm.; diameter, 1.2 mm. U. S. Nat. Mus. Cat. No. 108103.

One specimen off Fernandina.

The small size and the spiral grooving distinguish this species from any of the others so far described.

**Genus VETULONIA Dall, 1913****VETULONIA JOSEPHINAE, new name**

*Trochus cancellata* JEFFREYS, Proc. Zool. Soc. London for 1883, p. 96, pl. 20, fig. 4 (not of Roemer, 1835), Josephine Bank.

Off Georgia and Fernandina, rare.

The specimens have been compared with Jeffreys's type.

**VETULONIA DENSILIRATA, new species**

Shell resembling *josephinae* but with depressed, almost flat spire, about 35 axial lamellae on the last whorl, the spiral sculpture finer and closer, and the aperture almost circular with continuous margin. Height, 2 mm.; diameter, 3 mm. Cat. No. 108116, U. S. N. M.

Two specimens off Fernandina.

**Genus MOLLERIOPSIS Bush, 1897****MOLLERIOPSIS SINCERA Dall**

*Adeorbis sincera* DALL, Proc. U. S. Nat. Mus., vol. 12, p. 338, pl. 12, fig. 2, 1889.

*Mollerioopsis sincera* BUSH, Trans. Conn. Acad. Sci., vol. 10, p. 138, 1897.

Off Georgia and Fernandina, abundant.

## Genus COCCULINA Dall, 1882

## COCCULINA RETICULATA Verrill

*Cocculina reticulata* VERRILL, Trans. Connecticut Acad. Sci., vol. 6, p. 426, 1885.

One specimen off Fernandina. Off Marthas Vineyard and south to St. Kitts, West Indies, United States Fish Commission.

## COCCULINA GEORGIANA, new species

Shell small, ovate, white, the sculpture like that of *C. reticulata*; the apex at the posterior third, slightly arcuate, the nepionic shell small, subcylindrical, horizontally projecting, smooth; sides nearly parallel, the posterior end a trifle wider; the ends evenly rounded, the margins entire. Length, 3.5 mm.; width, 2.5 mm.; height, 1.7 mm. U. S. Nat. Mus. Cat. No. 108281.

Off Georgia, 20 specimens.

Like *C. reticulata* in a general way but uniformly smaller and with a different apex.

## COCCULINA? ROTUNDA, new species

Shell small, elevated, conical, white, apex central, erect, blunt; surface with concentric incremental lines and occasional extremely faint sparse radiating lines; aperture circular, margin entire. Height, 2.1 mm.; diameter, 3.2 mm. U. S. Nat. Mus. Cat. No. 108156.

Off Fernandina, six, and off Georgia, nine specimens.

The symmetrically rounded cone is so different from the form of most of the other species as to give rise to a suspicion that this may not be a true *Cocculina*.

## Genus BASILISSA Watson, 1879

## BASILISSA (ANCISTROBASIS) RHYSSA, new species

Shell very small, turbinate, brownish, with six slightly rounded whorls and a minute transparent, glassy nucleus of about one whorl; the whorls acutely carinate; suture distinct, not deep; axial sculpture of small flexuous equal and equally spaced threads ceasing at the carina; base smooth, polished, with a shallow depression in front of the carina; the umbilicus small, deep, funicular, with no keel at the verge; spiral sculpture of one or two prominent keels between the suture and carina, very slightly affected by the axials, and a few faint spiral striae; aperture subquadrate (mature?), the margins thin and flexuous. Height, 2 mm.; diameter, 2.1 mm. U. S. Nat. Mus. Cat. No. 108145.

Off Georgia and Fernandina, not rare. Also at station 2 of the *Blake*, off Cuba, in 220 fathoms.

The brownish color may be adventitious. The small size and compact form are its chief characters, with the rather rough sculpture.

**Genus GANESA Jeffreys, 1883****Subgenus LISSOSPIRA Bush, 1897****LISSOSPIRA PROXIMA Tryon**

*Cyclostrema proxima* TRYON, Manual Conchology, vol. 10, p. 98, pl. 33, fig. 4, 1888.

*Lissospira proxima* BUSH, Trans. Connecticut Acad. Sci., vol. 10, p. 130, pl. 22, fig. 3, 1897.

Four specimens off Fernandina and 13 off Georgia.

In Miss Bush's article she makes an older genus a subgenus of one of her new genera, which is of course unauthorized by the rules of nomenclature.

**LISSOSPIRA BUSHAE, new species**

Shell resembling *L. proxima* Tryon, but larger, with a less elevated spire, nearly four white well-rounded, smooth, and polished whorls, a well-marked but not deep suture, a perforate umbilicus with no spiral striations around it, a convex base, the aperture nearly circular, the lips united over the body by a thin layer of enamel, margins thin, entire; the inner lip close to but not reflected over the umbilicus. Height, 3.3 mm.; diameter, 2.7 mm. U. S. Nat. Mus. Cat. No. 108139.

Two specimens off Fernandina.

**LISSOSPIRA CONICA, new species**

Shell small, white, smooth, polished, conic, with a little more than four whorls, moderately rounded, the immature specimens having an angle at the margin of the base on which the suture is laid, but this disappears on the last adult whorl; suture distinct, not deep; base rounded, the aperture rounded, the lips united over the body by a thin wash of enamel; the inner lip in the adult reflected over and nearly closing the small perforate umbilicus, which is not surrounded by any spiral sculpture. Height, 2 mm.; diameter, 1.7 mm. U. S. Nat. Mus. Cat. No. 108107.

Three specimens off Fernandina.

The relatively narrow conical form is not shared by any of the species described from the coast.

**LISSOSPIRA DEPRESSA, new species**

Shell small, depressed turbinate, white, smooth, with about three whorls, the last much the largest; whorls well rounded, suture distinct, not deep; base rounded, aperture somewhat oblique, angulated above and below, the lips simple, thin, not reflected, united by a layer of enamel over the body; umbilicus perforate, the verge marked by a distinct angle, not surrounded by any spiral sculpture. Height, 1.5 mm.; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 108131.

Fifteen specimens off Fernandina.

**LISSOSPIRA VALVATA, new species**

Shell small, white, smooth, polished, with about four well-rounded whorls, separated by a distinct but not deep suture; spire only moderately elevated, the nucleus small, glassy; base rounded, smooth, with a small perforate umbilicus; aperture circular, slightly oblique, the margins simple, thin, except that the inner lip near the umbilicus is slightly reflected and thickened; some of the immature specimens show a slight angulation around the umbilical depression. Height, 2 mm.; diameter, 2.6 mm. U. S. Nat. Mus. Cat. No. 108129.

Off Fernandina and Georgia, abundant.

This resembles *L. depressa* but is larger, the whorls more regularly enlarging and one more in number.

The small shells which have been included in *Cyclostrema*, *Adeorbis*, *Vitrinella*, and so on by authors, undoubtedly belong to a considerable variety of groups. Their proper reference in classification must be tentative until their anatomy and other characters than those of the shells are definitely known.

**Genus GRANIGYRA Dall, 1889****GRANIGYRA LIMATA Dall**

*Cyclostrema (Granigyra) limatum* DALL, Bull. Mus. Comp. Zoöl., vol. 18, p. 395, 1889; Bull. 39, U. S. Nat. Mus., p. 166, 1889.

*Granigyra limata* BUSH, Trans. Connecticut Acad. Sci., vol. 10, pp. 115, 135. 1897.

Off Georgia and Fernandina, not rare. Blake station 19, in 310 fathoms, Gulf of Mexico. United States Fish Commission station 2150, near Old Providence Island, in 382 fathoms, ooze, bottom temperature 46° F.

**GRANIGYRA RADIATA, new species**

Shell resembling *G. Limata* but more closely coiled, the granulation less coarse, with three and one-half whorls, the last whorl much the largest; the suture distinct, not deep, with a fringe-like series of short radiating grooves not reaching the periphery; base rounded with a perforate umbilicus around which fine wrinkles appear on the verge; aperture obovate, somewhat angulated above, the margins thin, simple, not reflected. Height, 2.5 mm.; diameter, 2.3 mm. U. S. Nat. Mus. Cat. No. 108138.

Three specimens off Fernandina.

The radiating sculpture sufficiently distinguishes the species.

**Genus LYDIPHNIS Melvill, 1906=CIRCULUS Busch, 1897, not Jeffreys 1865****LYDIPHNIS MARGARITIFORMIS, new species**

Shell small, white, with nearly four whorls including a minute globular nucleus, having a general form much resembling *Margarites helicinus*; whorls moderately rounded, the last much the largest,

suture distinct, not deep; surface smooth except for faint incremental lines, and on the base two strong widely spaced threads around the umbilical pit and a few faint spiral striae behind them; base rounded, umbilicus minutely perforate; aperture rounded with a small angulation above, the peristome continuous over the body, thin, and not reflected. Height, 3 mm.; diameter, 4 mm. U. S. Nat. Mus. Cat. No. 108146.

Two specimens off Fernandina.

This differs from typical *Lydiophnis* in being less depressed and without carinae, but seems most nearly allied to that genus.

**LYDIPHNIS TRILIX** Bush

*Skenea trilix* BUSH, Comm. Fisheries Rept. for 1883, p. 584, 1885.

*Circulus trilix* BUSH, Trans. Conn. Acad. Sci., vol. 10, p. 127, pl. 22, figs. 6, 10, 10a, 12a-g; pl. 23, figs. 10, 15, 1899.

Off Fernandina, 25 specimens.

**LYDIPHNIS TRANSLUCENS**, new species

Shell minute, translucent white, the spire flattened, with three moderately rounded whorls; axial sculpture of incremental lines only; spiral sculpture of a thread slightly in front of the suture and another beyond the periphery on the base; these are hardly prominent enough to be called carinae; the umbilical pit is wide and shallow, the umbilicus itself minutely perforate; aperture rather wide, rounded, oblique, the margin thin, continuous, straight near the umbilicus. Height, 1.5 mm.; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 108434.

Off Georgia, two specimens.

Notwithstanding its small size it has the shell characters of the genus. The incremental lines are rather pronounced.

**LYDIPHNIS HENDERSONI**, new species

Shell small, white, depressed, glassy, with about three tricarinate whorls, the nucleus deeply sunken; axial sculpture of faint incremental lines, on the spire retractively oblique and on the base protractively arcuate; spiral sculpture of a prominent carina at the periphery, a less prominent one on the spire about one-third of the way from the suture to the periphery, and on the base another slightly nearer the umbilicus than to the periphery; these two secondary keels are variable, sometimes strong, sometimes almost obsolete, sometimes partly one or the other on the same specimen; the edges of the carina are sometimes finely spirally striated, suggesting that they may when fresh and intact carry a series of epidermal fringes like *Episcynia*; the space within the basal carina is funicular, extending to a moderately narrow perforate umbilicus; the aperture would be rounded, but in those specimens in which the

carinae are all developed the thin margin is modified and the aperture is angulated by them; in some specimens faint spiral striation is indicated on the surface between the carinae; the margin of the aperture in the adult is continuous over the body of the shell. Maximum diameter, 3.5 mm.; minimum diameter, 2.9 mm.; height, 1.3 mm. U. S. Nat. Mus. Cat. No. 108396.

Numerous off Georgia.

The periostracum on *Episcynia* is extremely fugacious, and it is not prudent to assume that these and other small shells dredged and showing none are normally without one. A few have a persistent periostracum, and there is no good reason to suppose that others never possess one. This interesting species is named in honor of the late J. B. Henderson, jr.

Genus VITRINELLA C. B. Adams, 1850

VITRINELLA MASSARITA, new species

Shell small, smooth, white, trochiform with three and one-half whorls, the nucleus globular; suture deep, the inflated whorls giving a somewhat turritid appearance to the shell; base amply rounded, the umbilicus minutely perforate, the whorl evenly rounded into it; aperture circular, the margins thin, sharp, united over the body; the only sculpture very faint incremental lines. Height, 1.5 mm.; diameter, 1.7 mm. U. S. Nat. Mus. Cat. No. 108137.

Three specimens, off Fernandina.

VITRINELLA CERION, new species

Shell small, white, smooth, polished, with about four whorls including a minute globular nucleus; whorls well rounded, separated by a distinct not deep suture in front of which is a narrow, flattish area; sculpture only of a few faint spirals on the earlier part of the spire; base well rounded with a small perforate umbilicus; aperture nearly circular, the margins united over the body by a thin layer of enamel. Height, 1.5; diameter, 1.8 mm. U. S. Nat. Mus. Cat. No. 108433.

One specimen, off Georgia.

The general form recalls that of *Helix chersina* Say.

VITRINELLA RHYSSA, new species

Shell small, depressed, white, with about two and one-half rapidly enlarging whorls following a small glassy globular nucleus; suture distinct, not deep; sculpture of close even prominent incremental lines over the whole shell; base rounded, umbilical pit excavated; aperture oblique, the margins separated by the body, slightly angular at their junction; from the lower angle a thread descends into the umbilicus. Height, 1.3 mm.; diameter, 2.1 mm. U. S. Nat. Mus. Cat. No. 108127b.

One specimen, off Fernandina.



## VITRINELLA? CARINIFEX, new species

Shell small, translucent white, the spire depressed, with three whorls, the last whorl much the largest; suture distinct, not deep; the last whorl with the periphery at the posterior third, giving an effect which calls to mind the rounded variety of the fresh-water *Carinifex*; sculpture only of feeble incremental lines; base with the slope toward the small umbilicus slightly flattened; the verge of the umbilicus almost carinate; aperture obovate, the lips thin, united over the body by a marked layer of enamel. Height, 2.5 mm.; diameter, 3.7 mm. U. S. Nat. Mus. Cat. No. 108399.

Off Georgia, three specimens.

This is probably not a true *Vitrinella* and may be immature but certainly is not the young of any of the species enumerated in this discussion.

## Genus PSEUDOROTELLA Fischer, 1857

## PSEUDOROTELLA SOLIDA (Dall)

*Ethalia solida* DALL, Bull. Mus. Comp. Zool., vol. 18, pt. 2, p. 362, pl. 28, figs. 3, 5, 1889.

Off Georgia and Fernandina, numerous. Also off Bahia Honda, Cuba, in 310 fathoms, bottom temperature 62° F., *Blake* expedition.

## PSEUDOROTELLA FLORIDENSIS, new species

Shell small, porcellaneous white, smooth, polished, turbate, with four well-rounded whorls; suture distinct, not deep; aperture nearly circular, the margin simple, continuous over the body with a marked deposit of enamel behind the body lip and over the umbilical region, completely closing the umbilicus and in the completely adult sometimes produced in subangulate form above and below. Height, 2 mm.; maximum diameter, 3 mm. U. S. Nat. Mus. Cat. No. 108133.

Off Fernandina, abundant.

This is much like *P. solida*, but larger, more elevated, and with the umbilical pad heavier and more simple.

## Genus CALLIOSTOMA Swainson, 1840

## CALLIOSTOMA BENEDICTI Dall

*Calliostoma (Eutrochus) benedicti* DALL, Bull. Mus. Comp. Zool., vol. 18, p. 371, pl. 32, fig. 7, 1889.

Two very young specimens off Fernandina. Off Cape Lookout, N. C., in 200 fathoms. United States Fish Commission.

The Trochidae in this collection are chiefly represented by immature and sometimes very small specimens.

## CALLIOSTOMA (EUTROCHUS) HENDERSONI Dall

*Calliostoma hendersoni* DALL, Proc. U. S. Nat. Mus., vol. 70, No. 2668, p. 7, Feb. 1927.

Off Fernandina, one very young specimen, and off the Sambo Reef, Fla., in 116 fathoms. Henderson.

**CALLIOSTOMA (EUTROCHUS?) TITTARIUM, new species**

Shell small, bluntly conical, white, with about five whorls and a small subglobular nucleus; surface polished, the whorls flattened, the last whorl subcarinate, the base slightly convex, with a minutely perforate umbilicus partly obscured by a reflection of the pillar lip; spiral sculpture variable; usually there is a sharp groove just behind the rather obscure suture, the rest of the of whorl behind this groove smooth; other specimens have several grooves on this part of the shell and others on the base; there are always one or two strong cords around the umbilicus; there is no visible axial sculpture; aperture subquadrate, the pillar lip straight, simple, thickened near its insertion. Height, 3.5 mm.; major diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 108417.

Off Georgia, three, and off Fernandina, six specimens, mostly in poor condition.

**CALLIOSTOMA HALIBRECTUM, new species**

Shell small, depressed, turbinate, whitish, with about five moderately convex whorls, more or less constricted in the sutural region, and a very minute, mostly immersed, smooth nucleus; base flattish and apparently smooth within the rounded peripheral carina; spiral sculpture of (on the last whorl about a dozen) subequal flattish threads between the carina and the preceding suture; these are cut very obliquely by sharp retractive grooves, producing a rather uniform series of small diamond-shaped, flattish sections of the threads; base imperforate, aperture defective but apparently subquadrate, with a thick pillar. Height of specimen, 6 mm.; major diameter, 9 mm. U. S. Nat. Mus. Cat. No. 108126.

One specimen off Fernandina, in poor but recognizable condition.

**CALLIOSTOMA ARESTUM, new species**

Shell small, brownish or whitish, with four and one-half whorls following a polished white nucleus of somewhat less than one whorl; form subconic with very prominent sculpture; spiral sculpture on second whorl two, on the third whorl three, on the last whorl above the base four, and on the base six spirals, of which two near the periphery are stronger, the one in front smaller but conspicuously beaded, those on the imperforate base similar, smaller, with subequal interspaces, two or three near the axis more prominently beaded; all the spirals show more or less obscure tendency to beading; there is also a fine simple undulated thread between the first two spirals on the last whorl; axial sculpture only of retractively oblique incremental lines; aperture rounded except as modified by the sculpture, the pillar straight with a conspicuous notch at the anterior end. Height of shell, 5 mm.; of last whorl, 3 mm.; major diameter, 5 mm. U. S. Nat. Mus. Cat. No. 108412.

Off Georgia, 14 specimens and fragments.

The species recalls *C. circumcinctum* Dall, but the minor sculpture is quite different.

**CALLIOSTOMA TRACHYSTUM, new species**

Shell minute, whitish subturbin ate, with a little more than three well-rounded whorls, with a minute glossy globular nucleus; spiral sculpture of (on the last whorl above the base, five) subequal prominent threads, and on the base about five flattish, rather obscure threads; the spirals are not evident on the earlier whorls; axial sculpture on the spire of fine obliquely retractive threads with wider interspaces; as these appear on the last whorl and intersect the spirals above the base, minute sharp pustulation is produced, but not on the base which is rounded and very minutely perforate; aperture rounded with a small callus on the pillar. Height, 2 mm.; major diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 108419.

One specimen off Georgia.

This may be not quite adult, and possibly referable to *Solariella*.

**CALLIOSTOMA (EUTROCHUS?) KAMPSA, new species**

Shell small, white, turbin ate, of about five well-rounded whorls with a very minute glassy nucleus of about one whorl; suture distinct, not deep; the first three whorls are almost smooth, the fourth shows three, the last five prominent equally distributed spiral cords above the base, two smaller beaded threads between the preceding suture and the first cord, and about a dozen simple spirals on the base; axial sculpture on the last pair of whorls of obliquely retractive sharp threads which are chiefly conspicuous in the interspaces and do not nodulate the spiral cords; these are feeble on the base except near the verge of the umbilical pit where they nodulate minutely the two nearest spirals; the base is evenly rounded, the umbilicus deep and narrow; the aperture is rounded, simple, with a thin straight pillar, the lips not united across the body; height of shell, 5; of last whorl, 3; major diameter, 5 mm. U. S. Nat. Mus. Cat. No. 108423.

One specimen and two fragments off Georgia.

This is another species on the border line between *Eutrochus* and *Solariella*, conchologically.

**Genus SOLARIELLA Wood**

**SOLARIELLA CALATHA, new species**

Shell small, somewhat depressed, whitish, with a small globular protoconch and about one smooth nuclear whorl, followed by four or more sharply sculptured whorls; suture obscure, in a deep channel formed by the prominent spiral in front of it; the second and third whorls show a single threadlike spiral between the presutural ridge and the succeeding suture; the last whorl has two prominent cords,

one on each side of the periphery, and three less prominent on the base, the inner one forming the margin of the funicular umbilicus; axial sculpture of sharp radiating lamellae, nodulose on the presutural ridge, with much wider interspaces, only slightly enlarged where they cross the spiral cords, beading the verge of the deep umbilicus into which they prominently descend; base rounded under the sculpture, aperture rounded except for the modification by the spiral sculpture, thin sharp-edged, somewhat oblique. Height of shell, 4; of last whorl, 3; major diameter, 5 mm. U. S. Nat. Mus. Cat. No. 108424.

Thirteen specimens and fragments off Georgia, and 19 young shells off Fernandina. A fragment has a major diameter of 6 millimeters, but the description is based on a younger and more perfect specimen.

*SOLARIELLA ANOXIA*, new species

Shell small, white, with about five whorls following an obliquely tilted glassy subglobular nucleus; the cone of the shell is acute, except that the last whorl suddenly disproportionately enlarges; suture distinct, a small flattening in front of it gives a slight effect of tabulation to the whorls; spiral sculpture of (on the spire two, on the last whorl above the base, five) rather angular ridges, on the last whorl one near the suture, and four a little nearer the periphery, alternating in prominence, with subequal interspaces, and on the rounded base with much wider interspaces; there is no sharp edge to the moderate-sized funicular umbilicus; axial sculpture of numerous low equal and equally spaced vertical lamellae which extend over the whole surface minutely nodulating the intersections with the spiral sculpture, forming a neat reticulation; aperture rounded, the lips thin, united over the body by a thin wash of enamel. A variety occurs with the spirals feeble or partly obsolete. Height of shell, 3; of last whorl, 1.7; major diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. of type, 108142; of the variety, 108420.

Ten specimens, mostly young, off Fernandina, nine off Georgia.

*SOLARIELLA TUBULA*, new species

Shell small, white, depressed conical, with four well-rounded whorls following a glassy subglobular nucleus; suture distinct, not deep; spiral sculpture of a few feeble striations in front of the suture, the periphery mostly smooth, and two or three threads around the verge of the wide funicular umbilicus; axial sculpture, most distinct on the younger whorls, of numerous equal and equally spaced radiating wrinkles, most prominent on the shoulder of the whorl, barely reaching the periphery, and frequently obsolete on the last whorl; there is sometimes a low ridge near and in front of the suture, giving an excavated look to the depression between them, and in crossing this ridge the wrinkles become feebly nodulous at the intersections. Height of shell, 3; major diameter, 5 mm. U. S. Nat. Mus. Cat. No. 108140.

Abundant off Fernandina, fewer off Georgia. The aperture is simple and rounded, the lips thin and sharp, with a thin wash of enamel uniting them over the body.

**SOLARIELLA TUBULATA** new species

Shell small, white, conic, with a glassy nucleus of about one whorl, and four subsequent tabulate normal whorls; suture distinct, not channeled; the first whorl smooth, the second and third with two prominent spiral threads, one on each side of the periphery, and three on the last whorl, with a fine thread sometimes between them, with several on the moderately convex base; axial sculpture of well-marked oblique incremental lines and on the periphery between the major spirals, connecting threads with wider interspaces nodulating the intersections with the threads; aperture oblique, rounded except as modified by the sculpture, the lips thin, the pillar lip straight, with a small perforate umbilicus behind it. Height, 3.5; major diameter, 3 mm. U. S. Nat. Mus. Cat. No. 108109.

One specimen (the type) and a fragment off Fernandina, and six off Georgia, mostly defective.

**SOLARIELLA TIARA** Watson

*Trochus (Zizyphinus) tiara* WATSON, Linn. Soc. Journ., vol. 14, p. 696, 1879;

*Challenger* Gastropods, p. 60, pl. 6, fig. 4, 1885.

*Calliostoma tiara* DALL, Bull. Mus. Comp. Zool., vol. 9, p. 45, 1881.

One specimen, rather dilapidated, from off Fernandina, may probably belong to this species. St. Thomas and Bermuda, *Challenger* expedition.

**New section MICROPILISCUS** Dall

Shell like *Solariella* but with a brown nucleus of several whorls and depressed turbinate form.

*Type*.—*Solariella constricta* Dall.

The normal nucleus of *Solariella* is small, white, with usually a subglobular glassy protoconch more or less immersed in the spire.

**SOLARIELLA (MICROPILISCUS) CONSTRICTA**, new species

Shell minute, greasy white, with a brown (horny?) nucleus of two whorls and depressed turbinate form and three subsequent well-rounded whorls; suture distinct, deeply constricted; spiral sculpture of fine almost microscopic striae over the whole surface; axial sculpture of very oblique fine incremental lines; base rounded, more strongly striated, with a very minute perforate umbilicus, aperture rounded, the lips thin, united over the body by a deposit of enamel. Height, 3.5; major diameter, 3.1 mm. U. S. Nat. Mus. Cat. No. 108414.

Seven specimens off Georgia.

**Genus MARGARITES Leach****MARGARITES (LIRULARIA) MIONA, new species**

Shell minute, white, trochiform, with a minute smooth nucleus and about three and one-half subsequent whorls; the nucleus is somewhat obliquely set; whorls well rounded, the suture distinct; spiral sculpture variably strong or feeble, with usually three or four threads in the vicinity of the periphery, feebler ones on the base, with one or two stronger around the umbilicus; axial sculpture of numerous radial wrinkles extending from the suture to the first spiral thread, then obsolete, except in strongly sculptured specimens on which the axial sculpture reappears on the base, especially near the umbilicus, and rarely shows as beading on the stronger spirals; umbilicus moderate, without an angular verge; aperture rounded, lips thin, united by enamel over the body. Height, 2; major diameter, 1.6 mm. U. S. Nat. Mus. Cat. No. 108143.

Twenty-five specimens off Fernandina and three off Georgia.

**Genus DILLWYNELLA Dall****DILLWYNELLA MODESTA Dall**

*Dillwynella modesta* DALL, Bull. Mus. Comp. Zool., vol. 18, p. 362, pl. 21, figs. 3, 3a, 1889.

One specimen off Fernandina and five off Georgia, mostly immature. Off Santa Lucia in 226 fathoms, bottom temperature 51° F.

**Genus LIPPISTES Montfort****LIPPISTES? PLANORBIS, new species**

Shell minute, white, evenly enrolled, the whorls adjacent, about two and one-half in number; spiral sculpture none; axial sculpture of fine, close, even threadlike vertical wrinkles surrounding the whorl, feebler on the periphery; aperture circular, entire. Height, 0.7; major diameter, 1.2 mm. U. S. Nat. Mus. Cat. No. 108091.

One specimen off Fernandina.

The shell may not be mature. The enrollment is remarkably planate.



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# DIAGNOSES OF UNDESCRIBED NEW SPECIES OF MOLLUSKS IN THE COLLECTION OF THE UNITED STATES NATIONAL MUSEUM

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In revising portions of the collection of mollusks a number of species were found which during a previous revision had been recognized as new, and had had a manuscript name inscribed on the label, but which by some chance had escaped publication. Some of these names have found their way into the literature, although undescribed, and it seemed desirable that proper diagnoses should be supplied. To these in this paper have been added a few other new species recently received.

## Genus **DENTALIUM** Linnaeus, 1758

### **DENTALIUM NAGOENSE**, new species

Shell slender, translucent white, with circular section, the posterior orifice entire; the surface brilliantly polished, without sculpture except faint incremental irregularities; length, 40; diameter at orifice, 3; perpendicular to the arch of the curve, 2.6 mm. U. S. Nat. Mus. Cat. No. 333718.

Dredged in 15 fathoms at Nago, Okinawa, Loochoo (Riukiu) Islands by Langford and Thaanum.

This at first sight is very close to *D. luchuannum* Dall, but lacks the posterior longitudinal striation, while the posterior third is less curved and more slender than in that species.

### **PENDROMA**, new genus

#### **PENDROMA PERPLEXA**, new species

Shell small, whitish, subturbinata, with nearly four rapidly enlarging, well rounded whorls; nucleus minute, smooth; later whorls axially sculptured with numerous sharp, irregularly spaced, low plications, which cross the early whorls, but on the last whorl become obsolete beyond the periphery; these are crossed by low, simple slender spiral threads with mostly wider interspaces, forming with the

plicae an irregular reticulation; suture deep but not channelled; aperture subovate, the outer lip sharp, flexuous, patulously produced medially; pillar lip thin, with a narrow umbilical chink behind it, united with the outer lip by a thin layer of enamel over the body; the umbilical chink is continued behind the inner lip by a kind of shallow groove; height, 3; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 330840.

Dredged at station 2764, off Rio de la Plata in 11.5 fathoms, sandy bottom by United States Bureau of Fisheries steamer *Albatross*; two other specimens were obtained at station 2751, in 687 fathoms globigerina ooze, bottom temperature 39° F. off St. Kitts, West Indies. Cat. No. 330727.

This little shell has features recalling *Fossarus*, *Lacuna*, and *Rissoina*. The specimens did not retain the operculum. It has somewhat the aspect of *Cithna cincta* Jeffreys

NATICA (STIGMAULAX) CUBANA, new species

Shell small, whitish with a tinge of brown, of about four whorls; nucleus small, smooth, globular, subsequent whorls axially sculptured with numerous radial grooves, rather strong at first but soon dwindling to sharp narrow striae which pass entirely over the shell with much wider interspaces; there is a very faint fine spiral striation visible only in the grooves under a lens; suture distinct, not deep nor glazed over; aperture semilunate; outer lip sharp, roundly arcuate, with only a moderate thickness of enamel on the body; umbilicus deep with a very large funiculum; operculum calcareous, white, with a strong spiral rib externally in the middle of the surface and two smaller ridges outside of it, the space inside the rib being smooth; height, 5; diameter, 5 mm. U. S. Nat. Mus. Cat. No. 333745.

Collected by the late J. B. Henderson, jr., on the shore at Guantanamo, Cuba.

This might be taken for the young of *S. sulcata* Born, but is not cancellate and has the same number of whorls as a specimen of *sulcata* 16 mm. high.

CREPIDULA AEOLA, new species

Shell small, rather narrow, strongly arcuate, the right side spirally slightly impressed; the apex marginal, strongly decurved, blackish, not spiral; sculpture of close set, numerous, narrow, equal, longitudinal, similar threads (due probably to the sculpture of the situs), which are found on all the specimens; transverse sculpture only of irregularities of growth; basal color externally yellowish spotted with short narrow streaks of a blackish purple; internally dark brownish purple except the septum, which is white; extreme margin minutely spotted; the anterior margin of the septum nearly straight; length of shell, 18, breadth, 12; convexity, 6 mm. U. S. Nat. Mus. Cat. No. 364424.

Collected near Cartagena, United States of Colombia, by T. A. Link.

A number of specimens were obtained. The animal evidently prefers to settle on a spiral shell, probably one with a band near the suture like a *Terebra*, which would account for the impressed right side. The margins are not crenulate, in spite of the sculpture, which may be a normal character of the species. The coloration is uniform in all the specimens, and quite unlike any other *Crepidula* known from the western Atlantic. There is a variable concavity under the apex which usually is feeble or obsolete.

ACMAEA PULCHERRIMA (Guilding MS), new species

*Patella pulcherrima* "GUILDING," Beau, Journ. de Conchyl., vol. 2, p. 426, 1851; Cat. coq. Guadeloupe, p. 19, 1858—PETIT, Journ. de Conchyl., vol. 5, p. 155, 1856.—PFEIFFER, Mal. Blatt, vol. 4, p. 27, 1857.—KREBS, W. I. Marine Shells, p. 89, 1864. (Name only in each case.)

*Patella candeana* PETIT, Journ. de Conchyl., vol. 5, p. 155, 1856, not of Orbigny. *Acmaea punctulata* (Gmelin), var. *pulcherrima* PILSBRY, Man. Conch., vol. 13, p. 38, 1891.

For three-quarters of a century the name of this species has appeared in the literature, due probably to the distribution of named specimens by Guilding; but neither Doctor Pilsbry nor myself has been able to discover any published description or figure. In revising the collection of east American limpets in the National Museum many hundreds of this form were found from widely distributed localities. Though nearest to certain varieties of *A. punctulata* (hybrids?), as indicated by Doctor Pilsbry, it seems worthy of specific rank.

Shell small, depressed, thin, usually with a glassy surface, the apex slightly in front of the center of the shell, the margin entire; sculpture of the surface when fully developed of fine numerous, subequal, not dichotomous, low riblets finely imbricated by numerous low sharp concentric lamellae; these are usually worn off or absent on beach specimens; the color of the shell is pinkish, either suffused or in obscure rays, sometimes broken into dots; the interior whitish, with, in fully adult specimens, a narrow pinkish brown margin; length of shell, 16; apex to anterior margin, 7; width, 11; height, 4 mm. U. S. Nat. Mus. Cat. No. 250071.

The specimen selected as type is from St. Thomas, West Indies, collected by Maurice Petit. The species is common throughout the Antilles and south Florida.

LIOTIA (LIPPISTES) TORTUGANA, new species

Shell small, planorboid, white, with about three whorls; spire flattened, base with a wide funicular umbilicus; whorls with a strong carina above and below the periphery and a feeble one midway between them; there is also a spiral thread midway between the suture and the posterior carina; whorls rapidly enlarging; axial sculpture of equal and at first equally spaced ribs about 20 on the last whorl; these cross

the whorl on its earlier part, rising into prominent knobs on the carina; on the latter part the ribs gradually become obsolete, but the knobs become larger and more distantly spaced; beside these the whole surface is covered with prominent close-set incremental lines which give a striated aspect to it, especially on the knobs; the lumen of the whorl is circular, but the aperture, by the prominence of the carinae, has a quadrate appearance; maximum diameter, 5.5; minor diameter, 4.2; height, 3.0 mm. U. S. Nat. Mus. Cat. No. 333708.

Dredged by the late John B. Henderson, jr., in 16 fathoms off the Tortugas, and near Miami, Fla., in 35 fathoms.

The species is superficially much like *L. acrilla* Dall, but the minor sculpture is different. There is no indication of a thickened peritreme but the specimens may be slightly immature.

*LIOTIA (LIPPISTES?) HUESONICA*, new species

Shell small, white, of about four and a third rapidly enlarging whorls, the spire somewhat elevated and tabulate; suture distinct, not deep; top of the whorls between the suture and the peripheral carina somewhat flattened, as is the base between the verge of the deep umbilicus and the anterior carina; spiral sculpture of (on the periphery three) strong subequal imbricate carinae with nearly equal interspaces, two of the carinae show on the spire, and on the younger whorls the imbrications become almost spinose; the early whorls are crossed by close-set small riblets corresponding to the imbrications, but on the base of the last whorl these become obsolete, reappearing as strong crenulations on the rim of the umbilicus; other axial sculpture of fine incremental oblique lines; aperture subcircular except as modified by the ends of the carinae; height, 4.2; maximum diameter, 4.5 mm. U. S. Nat. Mus. Cat. No. 333710.

Dredged by Henderson off Key West in 90 fathoms and off the other Keys of Florida in 90 and 95 fathoms.

Though not possessing the depressed spire so conspicuous in typical *Lippistes*, the other characters are so closely related to that group that it is doubtful if they should be separated.

*LIOTIA BRASILIANA*, new species

Shell small, solid, white, with radiating blotches of rose pink and about four whorls, of which the earlier ones are subtabulate; suture closely appressed; nucleus minute, smooth; spiral sculpture of (on the periphery of the last whorl three) prominent crenulated cords with a smaller thread in the interspaces, and three or four other minor threads between the suture and the posterior major cord; on the base the deep narrow umbilicus has a coarsely crenulate margin with four equal crenulate minor threads between it and the anterior peripheral cord; the aperture is circular with a thickened peristome somewhat

crenulated by the external sculpture; the very fine incremental lines give a velvety appearance to the interstices of the sculpture; height, 4; diameter, 5 mm. U. S. Nat. Mus. Cat. No. 214135.

Collected by the United States Bureau of Fisheries steamer *Albatross* in 20 fathoms southeast of Cape Roque, Brazil, at station 2758, bottom temperature 79.9° F.

This species does not belong with the *Arene* type in spite of its coloration.

**LIOTIA MICROGRAMMATA, new species**

Shell minute, yellowish white, of about three and a half whorls, the nucleus glassy, smooth and inflated; suture distinct, not deep; spiral sculpture of prominent simple revolving cords, with subequal interspaces, the cords near the periphery prominent; there are three on the spire, on the last whorl three above and four on the base; whorls rounded, the base imperforate, the aperture circular with a conspicuously thickened smooth peritreme; height, 2, diameter, 2 mm. U. S. Nat. Mus. Cat. No. 333713.

Collected by the United States Bureau of Fisheries steamer *Albatross* at station 2339, in 191 fathoms, off Havana, on a coral bottom.

**SOLARIELLA PERISCOPIA, new species**

Shell small, translucent white, dotted or flecked with pale brown; the nucleus glassy white, of two whorls, with two and a half subsequent whorls; suture distinct, whorls evenly rounded; axial sculpture of numerous fine plications extending from the suture to the periphery, obsolete on the base, but indicated by a row of minute beads at the rim of the funicular umbilicus; spiral sculpture of numerous subequal fine threads with nearly equal interspaces, more conspicuous on the periphery and base; aperture rounded, the peritreme thin and sharp; height, 3.0; maximum diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 330170.

Dredged by the United States Bureau of Fisheries steamer *Albatross* at station 2612, off Cape Lookout, N. C., in 52 fathoms, sand, bottom temperature 67° F. Also at Mangrove Cay, Andros Island, Bahamas, by Owen Bryant; and off Cape Catoche, Yucatan, at station 2361 in 25 fathoms, coral sand, by the United States Bureau of Fisheries steamer *Albatross*.

**CALLIOSTOMA IHERINGI, new species**

Shell rather large, solid, with about six whorls exclusive of the (lost) nucleus; color whitish with irregular feeble streaks of reddish brown obliquely axial; the beaded spirals are articulated with small dots of the same color; whorls and base moderately convex, suture closely appressed; spiral sculpture of (on the penultimate whorl eight) subequal and equally distributed minutely beaded threads with subequal interspaces, rarely a small intercalary thread, but near the periphery

one of the threads is slightly larger than the rest; the last whorl has two or three larger threads near the periphery with seven smaller ones behind them and nine or ten on the base; aperture rounded quadrate, the pillar obliquely rounding into the simple lip without any marked projection; there is no umbilicus, the interior of the aperture is smooth and pearly white. Height of shell, 35; of last whorl, 23; maximum diameter, 35 mm. U. S. Nat. Mus. Cat. No. 333701.

Collected by Dr. H. von Ihering at Nicochea, Brazil. A younger specimen was obtained by him from near Monte Hermosa, Argentina.

This is the largest and most conspicuous species of the genus from the Brazilian coast.

**CALLIOSTOMA DEPICTUM, new species**

Shell small, solid, with about five well-rounded whorls, exclusive of the (lost) nucleus; color pale buff, with conspicuous crimson rather distant spots articulating the spiral sculpture; the decorticated apical whorl is blackish brown, the umbilical region and the interior of the aperture white; sculpture on the last whorl above the periphery of five major threads with single minor threads intercalated between them; the threads are not beaded though the incremental lines cut them obscurely; there are about 12 minor close-set threads on the base with one or two coarser ones around the umbilical area; aperture rounded quadrate, margins simple, the concavely arcuate pillar rounding into the basal lip without any denticular prominence; umbilicus impressed, with a marked groove behind the pillar but not perforate. Height of shell, 10; of last whorl, 7; maximum diameter, 11 mm. U. S. Nat. Mus. Cat. No. 152667.

Collected at Bahia, Brazil, and received from Dr. H. von Ihering.

As the apex is somewhat eroded and the nucleus lost, the height normally may be a trifle greater.

**CALLIOSTOMA (RIOËNSE, var.?) HERMOSANUM, new species**

Shell of moderate size, resembling *C. rioëns* in form but much larger; color (possibly faded) pale straw color with faint indications of a few brownish obliquely axial streaks; whorls six or more, exclusive of the (lost) nucleus, rather flattish behind the periphery, the suture inconspicuous; spiral sculpture of (on the spire, six) close-set, closely beaded, subequal threads; on the base 12 without beads, and 3 coarser ones in the umbilical region; there is no axial sculpture except incremental lines; aperture subquadrate, margin simple, the pillar short, callous, smooth; there is no umbilicus; the interior of the aperture is smooth. Height of shell, 20; of last whorl, 12; maximum diameter, 19 mm. U. S. Nat. Mus. Cat. No. 152887.

Collected near Monte Hermosa, Argentina, by Dr. H. von Ihering.

None of the numerous specimens of *C. rioëns* in the collection approaches this in size, and none has so distinctly developed beading.

**CALLIOSTOMA HENDERSONI**, new species

Shell of moderate size, depressed conic, with a smooth nucleus of about one whorl, and six subsequent sculptured whorls, which overhang a little the succeeding suture and between the suture and the periphery are slightly concave; color pinkish yellow with the peripheral cord maculated with pink and white spots; spiral sculpture on the spire of on the earlier whorls four, on the penultimate whorl six, and on the last whorl seven or eight subequal beaded threads with narrower interspaces; on the periphery a much stronger smooth cord, and on the base 10 flattened, medially grooved, broadish, smooth spirals with narrower interspaces; the umbilical area is narrow and deeply perforate; aperture is subquadrate, the pillar short, arcuate, then forming an angle with the basal lip; interior of the aperture pearly white and smooth. Height of shell, 20; of last whorl, 13; maximum diameter, 24 mm. U. S. Nat. Mus. Cat. No. 333703.

Collected by the late John B. Henderson, jr., in 1916, off the Sambo Reefs, Florida, in 118 fathoms.

This attractive shell is nearest to *C. psyche* Dall, but differs in color, details of sculpture, and in the perforate umbilicus.

**CALLIOSTOMA SARCODUM**, new species

Shell small, dark red, with irregularly distributed subaxial white streaks, the spirals on the base more or less articulated with whitish and deeper red spots; nucleus very small, smooth, of about one whorl, with six subsequent, sculptured, flattish whorls; spiral sculpture of (on the last whorl six) beaded subequal threads, with a minor intercalary undulated thread in the interspaces; the spirals on the base are flattened and about eight in number, the intercalary threads very small; the margin of the base is subangular; the umbilical area is very small, white, and with a well marked pit behind the very short pillar, but no perforation; aperture subquadrate, the throat pearly white, the surface near the outer lip, for a short distance grooved in harmony with the outer sculpture, a feature perhaps due to immaturity. Height of shell, 8; of last whorl, 6; maximum diameter, 8 mm. U. S. Nat. Mus. Cat. No. 216955.

Collected by J. B. Henderson jr. at Barbados in 4 to 6 fathoms off "Lord's Castle."

**EUCHELUS BARBADENSIS**, new species

Shell small, flesh color, with scattered brownish dots, and a glassy nucleus of a whorl and a half with about three subsequent whorls; the entire surface covered with (on the last whorl 15) subequal beaded cords with narrower interspaces; whorls rounded, suture obscure; there is no obvious axial sculpture; aperture subcircular, the peritreme crenulate by the external sculpture, the pillar broad, white,



somewhat excavated, with a small protuberance anteriorly; the base is imperforate, the interior of the aperture brilliantly pearly; height, 9; maximum diameter, 9 mm. U. S. Nat. Mus. Cat. No. 21103.

Barbados, West Indies.

**MINOLIA AMBLIA, new species**

Shell small, dull purplish brown, polished, with about four depressed whorls; suture distinct, not deep; spiral sculpture of obscure simple small threads with wider interspaces over the whole surface; there is no obvious axial sculpture; base moderately convex with a narrowly perforate umbilicus; aperture subquadrate, oblique; pillar white, strong with a pustular prominence medially; peritreme simple; height, 3.6; diameter, 5.0 mm. U. S. Nat. Mus. Cat. No. 362226.

Uruguay, Dr. F. Felippone, (No. 3021).

**SOLARIELLA CROSSATA, new species**

Shell small, brilliantly polished, white, thin, with a bulbous sub-spherical smooth nucleus and about four subsequent whorls; suture distinct, the whorl in front of it depressed; axial sculpture of numerous equal and equally spaced plications radiating straightly from the axis but hardly reaching the periphery; these become more feeble toward the end of the last whorl; the incremental lines are delicate and silky; spiral sculpture of fine equal striation covering the whole surface, more or less strong in different individuals; around the rather wide funicular umbilicus is a strong more or less beaded cord with one or two conspicuous grooves outside of it; walls of the umbilicus finely spirally striated; aperture nearly circular, the margins thin, sharp; internally nacreous; height of shell, 2.2; diameter, 4.2 mm. U. S. Nat. Mus. Cat. No. 87358.

Dredged by the United States Bureau of Fisheries Steamer *Albatross* off Fernandina, Fla., in 294 fathoms sand, at station 2668, the bottom temperature 46.3° F.

This is somewhat like *S. actinophora* but smaller and less elevated, with feebler spirals.

**EMARGINULA PHRIXODES, new species**

Shell small, oval, whitish, the apex vertically incurved, nearly terminal, slit about one-fourth the anterior slope; sculpture of about 30 equal radial ribs with slightly wider interspaces crossed by about 16 concentric lamellae forming a deep reticulation, the interstices squarish, the intersections marked by very prominent blunt nodulations; anterior slope convexly evenly arched, the posterior slope very short and concave; interior white, the margin conspicuously denticulate; height, 3.5; length, 6; diameter, 4.5 mm. U. S. Nat. Mus. Cat. No. 333734.

Dredged by the late J. B. Henderson, jr., at his station 329, off the Sambo Reef, Florida, in 120 to 135 fathoms.

The very conspicuous sculpture differentiates the species from any other known from the region. The groove of the slit is inconspicuous both outside and inside the shell.

*RIMULA AEQUISCULPTA*, new species

Shell very small, white, ovate, the apex at the posterior fourth of the length, vertically incurved, not prominent; anal fissure about midway of the anterior slope, rounded behind, acute in front; sculpture of about 40 radial equal ribs crossed by equal close concentric threads, not nodulous where the threads over run the ribs; anterior slope prominently convex, the posterior slope straight; interior white, the margin slightly crenulate; height, 2.5; length, 5; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 333736.

Dredged by J. B. Henderson, jr., off Ajax Reef, Florida, at his station 368, in 80 to 100 fathoms. The species ranges south to Cuba.

The species is relatively much shorter, and much smaller than *R. frenulata* Dall, of the same region.

*DIADORA MICROSTICTA*, new species

Shell small, white, dotted more or less profusely with black spots, which, especially toward the apex, are rarely arranged in rays or concentric bands; margin oval, minutely denticulate; anal opening narrow, a little in front of the extreme apex which shows an eroded space; anterior slope somewhat shorter and narrower than the posterior; sculpture of major and (generally three) intercalary minor rays reticulated by numerous concentric threads which form sublunate small nodules where they cross the major rays and still smaller ones when they cross the minor rays; interior white, the margin finely radially grooved, the callus around the anal perforation sharply truncate behind; height, 7; length, 15; diameter, 10 mm. U. S. Nat. Mus. Cat. No. 333732.

Distribution from South Florida to Cape San Roque, Brazil.

This species has apparently been confused with varieties of *D. alternata* Say, but when segregated the differences are obvious.

*PUNCTURELLA HENDERSONI*, new species

Shell superficially similar to *P. princeps* Mighels and Adams, and best described differentially. The radiating ribs are stronger, and slightly more distant; finely and evenly, closely decussated by low equal concentric threads over the whole surface, the interstices conspicuous, as if punctate; the anal slit is narrow, projected forward with a longer furrow behind it than in *princeps*; internally the tube in *princeps* is more prominent and furnished with lateral props which are absent in *hendersoni*. Height of the latter, 6.5; length, 11; diameter, 8 mm. U. S. Nat. Mus. Cat. No. 333723.

Type from J. B. Henderson's station 330, off the Sambo Reef, Florida, in 120 fathoms. Other specimens are received from Maine and Florida, in 144 fathoms.

**PUNCTURELLA PAUPER**, new species

Shell quite small, yellowish white, with about 40 radiating sub-equal ribs, alternately slightly larger and smaller, reticulated by 15 or 20 low lamellae, stronger toward the margin, not nodulous where they cross the ribs; the interstices are square, not punctate; apex acute, not coiled; the slit narrow, nearly reaching the apex; interior smooth, the margin slightly crenulate; the anal fissure not provided with tube-like roof, but a small straight lamina bounds it behind; height of shell, 3; length, 5; diameter, 4 mm. U. S. Nat. Mus. Cat. No. 93906.

Dredged by the United States Bureau of Fisheries at Station 2135, south of Cuba in 250 fathoms, coral sand.

The shell is small, and may be immature but is quite distinct from the other known species of the coast.

In examining a very large number of specimens from the eastern coast of North America I find that in *P. princeps* and its variety (?) the presence or absence of props to the inner septum is an inconstant feature. They are usually, but not always, absent in the young and not always present in the adult. On the other hand, in some species their presence or absence appears to be a constant character. Among our northern forms *P. princeps* is marked by distinct punctuation in the interspaces between the ribs and an obscure beading on the ribs. In the supposed variety the ribs and interspaces are smooth. The latter closely resembles the European *noachina* and may be conspecific. Adult normal specimens usually have props to the septum. *P. noachina* is figured and described as possessing props but well grown specimens received from authentic sources in our collection are without them, while others possess them.

**SCISSURELLA PROXIMA**, new species

Shell minute, white, of nearly four whorls, the slit about one-fourth as long as the whorl; the suture distinct, not deep; the posterior surface between the suture and the fasciole arcuately striated; the base moderately convex, the surface nearly smooth, but under the lens showing a faint reticulation of the incremental lines with faint spiral threads; umbilicus perforate; the aperture rounded the pillar lip slightly reflected; height, 1.7; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 322962.

Dredged off South Carolina by the U. S. Bureau of Fisheries steamer *Albatross* at station 2314, in 159 fathoms coarse sand, bottom temperature 47.4° F.

The species is smaller and relatively more elevated than *S. crispata*; less elevated and with much less prominent sculpture than *S. alta*

Watson, especially on the base. It has been collected in 434 fathoms off St. Augustine, and in numerous other localities on the coast and off the Keys of Florida, in 20 to 200 fathoms.

*WILLIAMIA MAGELLANICA*, new species

Shell minute, ovate conic, thin, greenish yellow with purplish radiations, smooth, the apex prominent, briefly strongly incurved; length, 4; breadth, 3; height, 1.5 mm. U. S. Nat. Mus. Cat. No. 198711.

Two living specimens were collected on kelp by the United States Bureau of Fisheries steamer *Albatross* at Port Churruca, Magellan Straits.

This differs from the Antillean *W. Krebsii* Mörch, in darker color, the presence of strongly marked radial color bands, smaller size and more narrowly oval form. The apex also is more anterior, being in the anterior third of the shell.

*LEPIDOPLEURUS CARINATUS*, new species

Shell rather large for the genus, yellowish white, densely covered with minute pustules which are obscurely arranged concentrically to the mucro of the posterior valve, radially on the anterior valve and longitudinally on the intermediate valves; back subcarinate, the angle about 70°; eaves projecting, the insertion plates of the terminal valves not split but radially rugose, of the intermediate valves entire; girdle narrow, densely pilose, with extremely fine close minute spinules, with alternating darker and lighter patches; central, jugal and lateral areas not defined; length in dry, curved condition about 35, diameter, 9; height, 12 mm. U. S. Nat. Mus. Cat. No. 225149.

Type specimen received from Eastport, Me., from Prof. A. E. Verrill; others from 12 fathoms in the Gulf of Maine, and from Georges Bank, by one of the Gloucester fishermen.

This species is intermediate between *Lepidopleurus* and *Hanleya*.

*STEREOCHITON FELIPPONEI*, new species

Shell rather large, ivory white, dorsally subcarinate, dorsal angle about 90°; anterior valve with about 30 radiating widely spaced threads and microscopic punctuation; posterior valve with low subcentral mucro, behind sculptured like the anterior valve, the central area with minutely beaded longitudinal threads; intermediate valves with the jugal tract not defined, the pleural areas longitudinally threaded, the lateral areas with few obscure radial threads; the terminal valves irregularly strongly copiously grooved, with slitting too obscure to count, the intermediate valves with five or six slits; interior white, the sinus and short sutural plates hardly differentiated; girdle brownish with soft rather long silky hairs; length (dry), 50; width, 20; height, 10 mm. U. S. Nat. Mus. Cat. No. 333469.

Mar del Plata, Argentina, received from Dr. F. Felippone.



# THE OCCURRENCE AND PROPERTIES OF CHLOROPHOENICITE, A NEW ARSENATE FROM FRANKLIN, NEW JERSEY

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## INTRODUCTION

In a preliminary paper the writers<sup>1</sup> gave a short description of a new arsenate collected at Franklin during the year 1923. This mineral was found during mining operations between the 500 and 600-foot levels of the mine of the New Jersey Zinc Co. where it occurred in the pillars of ore that were being taken out at that time. Specimens of this arsenate were apparently very rare and all possible specimens of the mineral were procured for study. In all about a dozen specimens were obtained and several of the better ones were sacrificed for a sample for analysis. A larger specimen from which the material for analysis was taken is preserved in the United States National Museum (No. 94964, U. S. N. M.). A number of crystals from this specimen were taken for crystal measurement but better ones were found on a specimen in the Holden collection of Harvard University (No. 81224), the crystallographic data given being based on these.

This arsenate mineral proved upon chemical analysis to be new and the name chlorophoenicite was given to it. The name is derived from the Greek *χλωρος* (green) and *φοινικος* (purple red) in allusion to the remarkable property it possesses of changing its color from light green in natural light to a light purplish red in artificial light.

## OCCURRENCE

The chlorophoenicite occurs in cracks in the franklinite-willemite ore associated with tephroite, willemite, leucophoenicite, calcite, and zincite. Of these minerals the chlorophoenicite is later than all the minerals except the calcite. The sequence is apparently willemite and tephroite-leucophoenicite-chlorophoenicite-calcite. The willemite forms fine grained masses of minute acicular crystals. The

<sup>1</sup> Journ. Wash. Acad. Sci., vol. 14, pp. 362-363, 1924.

leucophoenicite is almost always present in small clear rose to purplish red prismatic crystals. The presence of this clear leucophoenicite is a good indication that chlorophoenicite may be present. Calcite occurs massive and covers many of the earlier minerals or is found as small hexagonal prisms. The chlorophoenicite is perched on all these minerals or rests directly on the franklinite-willemite ore, but rarely is inclosed in some calcite. The crystals are haphazardly arranged although they show at times a crudely radiating grouping. Two types of crystals were distinguished, long needle-like crystals forming an open reticulated mass or short, stumpy ones forming small groups of a few individuals or small crusts.

Several other arsenates have been found in the same workings from which the chlorophoenicite came, notably the silico-arsenate of manganese, schallerite and the arsenate of calcium and lead, hedyphane.

### CRYSTALLOGRAPHY

All the chlorophoenicite occurs in distinct crystals that reach a maximum size of 8 mm. in length and less than 1 mm. in thickness. The needles are always deeply striated parallel to the elongation and the terminal faces are etched and dull. Measurements of the crystals showed that they belong to the monoclinic system and that the plane of symmetry lies across the needles. The mineral is therefore elongated parallel to the ortho-axis *b*.

The data upon which the crystallographic calculations are based were obtained on rather inferior crystals, which, however, were the only ones available. The crystals were all warped in the zone of elongation and also considerably striated in that direction. Fourteen crystals were measured none of them exceeding 0.5 mm. in length. For convenience they were mounted with the elongated zone vertical and the resulting angular values, though in comparatively poor agreement, were averaged. The data obtained with the two circle goniometer are given in the table below.

*Measurements of crystal forms of chlorophoenicite*

	Number of read- ings	Maximum		Minimum		Average	
		° /	° /	° /	° /	° /	° /
1	18	75 22	90 00	72 59	90 00	74 26	90 00
2	14	1 04	90 00	-1 08	90 00	00 00	90 00
3	1					66 34	90 00
4	1					54 23	90 00
5	3	88 22	90 00	86 29	90 00	87 36	90 00
6	13	110 12	90 00	106 00	90 00	110 00	90 00
7	18	38 45	37 20	37 30	35 20	38 43	36 24

In the table on page 2 the angles were measured from the cleavage face taken as 010. The angles transposed to the normal position are given below.

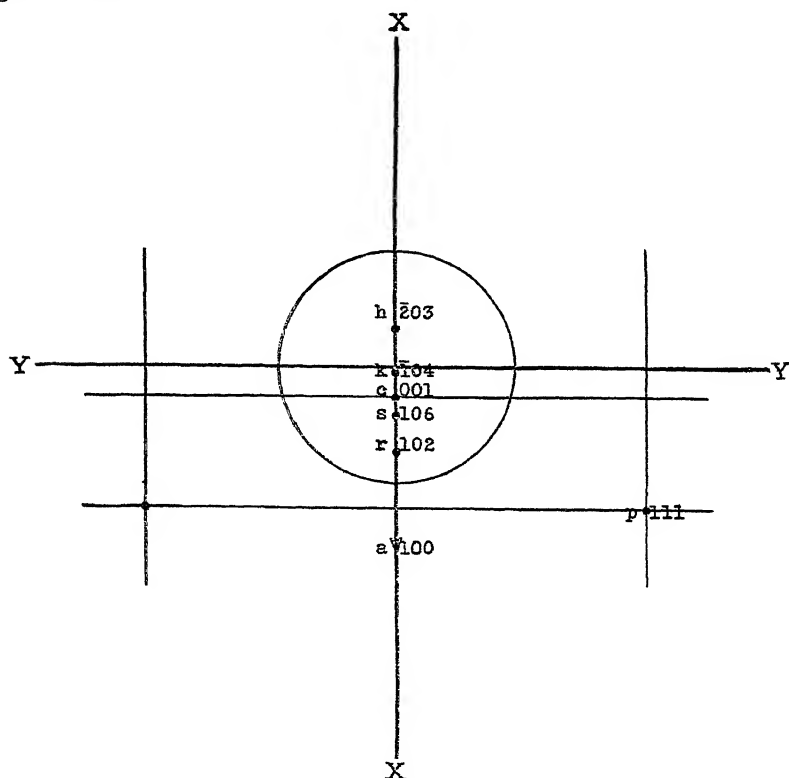


FIG. 1.—GNOMONIC PROJECTION OF THE CRYSTAL FORMS OF CHLOROPHOENICITE

*Angles of crystal forms of chlorophoenicite*

Letter	Symbol		$\varphi$	$\rho$
	Gold-schmidt	Miller		
c	0	001	90 00	15 34
a	$0\infty$	100	90 00	90 00
s	$+\frac{1}{2}0$	106	90 00	23 36
r	$+\frac{3}{4}0$	102	90 00	36 58
k	$-\frac{1}{4}0$	104	90 00	2 23
h	$-\frac{3}{4}0$	203	90 00	19 28
p	1	111	29 41	68 01

The distribution of the faces is shown in the gnomonic projection (fig. 1).



From these angles the following elements were calculated:

$$p=0.9135.$$

$$q=2.074.$$

$$r=1.$$

$$e=0.2684.$$

$$\mu=74^{\circ} 26'.$$

$$a=2.357.$$

$$b=1.$$

$$c=2.153.$$

$$\beta=105^{\circ} 34'.$$

The crystals usually show but four forms:  $c$  (001),  $a$  (100),  $h$  ( $\bar{2}03$ ) and  $p$  (111). Other forms noted were  $s$  (106),  $r$  (102) and  $k$  ( $\bar{1}04$ )

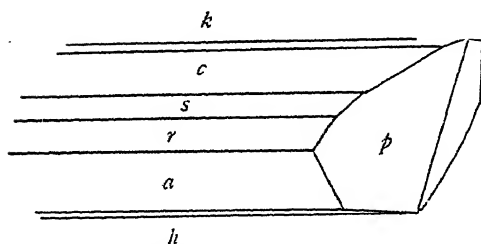
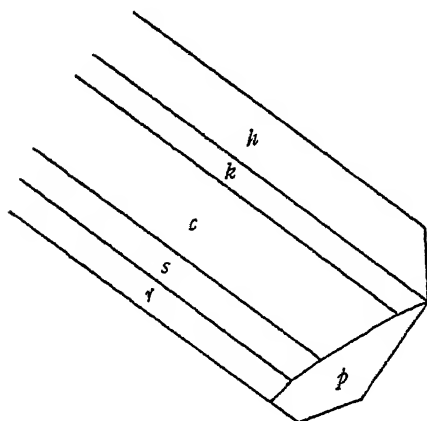


FIG. 2.—ORTHOGRAPHIC AND CLINOGRAPHIC PROJECTION OF CRYSTAL OF CHLOROPHOENICITE

(fig. 2). The base is usually the largest face on the crystal and is always more deeply striated than the other prominent faces. The face  $h$  ( $\bar{2}03$ ) is broad. The pinacoid  $a$  (100) is usually medium in size and is the brightest face on the crystal. The two terminal faces  $p$  (111) are badly etched and reflections from them are always poor. Of the other faces  $s$  (106) and  $r$  (102) were encountered once as narrow striated faces and  $k$  ( $\bar{1}04$ ) three times, likewise narrow and striated.

#### PHYSICAL PROPERTIES

The crystals have a good cleavage parallel to the front pinacoid,  $a$  (100). No other cleav-

ages could be detected. The crystals are brittle and break easily across the prisms as well as along the cleavage. The crystals easily scratch gypsum; calcite can be scratched by rubbing it across a crystal but fluorite seems to be unaffected. Its hardness then is 3 to 3.5.

#### OPTICAL PROPERTIES

Chlorophoenicite is grayish green in color but has a suggestion of pink on the pyramid faces. Under strong artificial light the crystals take on a purplish red or reddish gray color, deeper in tint on the

pyramid faces than on the dome zone. The lustre of the crystals is vitreous to pearly, the pearly lustre being more pronounced on the front pinacoid face to which the good cleavage is parallel. Some of the larger crystals have a slight iridescent tarnish.

The plane of the optic axes lies across the needles, that is, it lies in the plane of symmetry. Cleavage flakes show the emergence of an optic axes only slightly off center. The dispersion is strong with  $\rho$  greater than  $\nu$ ). Plates showing the emergence of an optic axis have anomalous interference colors characteristic of axes with high dispersion.  $2V$  measured with a micrometer ocular is  $83^\circ \pm 2^\circ$ . The optical character is negative. The indices of refraction measured by the oil immersion method were found to be as follows:

$$\alpha = 1.682$$

$$\beta = 1.690$$

$$\gamma = 1.697$$

The specific gravity, calculated from the relation  $\frac{n-1}{d} = k$  (Gladstone's rule) is 3.55.

#### CHEMICAL PROPERTIES

The color changes on heating from green to black and the mineral evolves abundant water, the crystal faces becoming rough and porous. Before the blowpipe the crystals become black, coloring the flame a faint pale blue and glow with a bright light. The crystals fuse only with difficulty. The mineral is soluble in acids and the solution reacts for arsenic, manganese, and zinc.

Material for analysis was obtained by carefully picking the clean crystals from the specimen which were then crushed and examined under the petrographic microscope and the sample found to be essentially pure. The amount available for analysis was one-quarter of a gram. Upon analysis the following results were obtained:

TABLE 1.—Composition of chlorophoenicite

	Actual analysis	Theoretical composition	Ratios	
Water (H <sub>2</sub> O)-----	11. 60	11. 4	0. 644	7. 05×9. 02
Lime (CaO)-----	3. 36		. 0599	
Magnesia (MgO)-----	1. 34		. 0332	
Ferrous oxide (FeO)-----	0. 48		. 0067	10. 55×9. 02
Manganous oxide (MnO)-----	34. 46	38. 5	. 4853	
Zinc oxide (ZnO)-----	29. 72	29. 3	. 3669	
Arsenic pentoxide (As <sub>2</sub> O <sub>5</sub> )-----	19. 24	20. 8	. 0836	. 92×9. 02
	100. 20	100. 0		

The analysis yields the formula  $10RO.As_2O_5.7H_2O$ , in which RO is essentially manganese and zinc with magnesia, lime and ferrous

oxide as minor constituents. The ratio of manganese to zinc is about 3:2. The theoretical composition for these ratios is given in Table 1. The formula may also be written  $R_3As_2O_8 \cdot 7R(OH)_2$ . It is therefore a hydroxyarsenate of manganese and zinc in which the ratio of hydroxide to the arsenate is remarkably high.

#### RELATIONSHIPS

In respect to the ratio of the arsenate to the hydroxide this mineral is quite exceptional. No other arsenate or phosphate approaches this ratio. Chondrarsenite, to which the formula  $Mn_3As_2O_8 \cdot 3Mn(OH)_2$  had been assigned, is now known to be sarkinite,  $Mn_3As_2O_8 \cdot Mn(OH)_2$ . The doubtful mineral xantharsenite to which the formula  $5MnO \cdot As_2O_5 \cdot 5H_2O$  has been assigned approaches nearest to chlorophoenicite. A specimen of this mineral from the collection of Colonel Washington A. Roebling has the following optical properties: Yellow structureless veins, biaxial positive, 2V medium,  $\alpha=1.705$ ,  $\beta=1.710$ ,  $\gamma=1.720$ . Neither the chondrarsenite nor the xantharsenite have been found in crystals. They show considerably more arsenic and less bases and differ appreciably in certain optical features. Chlorophoenicite is apparently quite distinct from either of these and is not related closely to any known mineral.



# A STONY METEORITE FROM FORKSVILLE, MECKLENBURG COUNTY, VIRGINIA

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The data concerning the fall of the stones here described were gathered by the late Dr. Thomas L. Watson, of Charlottesville, Va. Three of the four stones which, so far as known, comprised the entire fall, were secured by Doctor Watson at the time and brought by him to Washington for consultation with the present writer, with a resultant agreement to the effect that the chemical analyses, sections, and other essential cuttings should be done here while the microscopic studies should be his. The fourth and largest individual, secured later, was found among Doctor Watson's effects after his death.

According to Doctor Watson's notes, the fall took place within the town of Forksville, Mecklenburg County, in southern Virginia, on the afternoon of July 16, 1924, between the hours of five and six but nearer the last-mentioned hour. The stone was traveling in a northwest to southeast direction and was accompanied by the usual artillery-like explosions; the noise lasted four or five minutes but no light accompanied it—this doubtless due to the time of day. The record of the four stones as given is as follows: No. 1, weight 2,250 grams, fell about half way between Brodnax and Forksville on R. D. Temple's place; is reported to have been entirely cold when recovered some 15 minutes after the fall. No. 2, weight 1,850 grams, struck within some 450 feet of a woman who heard the explosion apparently directly overhead; it made a hole inclined at 10 degrees from the vertical, some 6 inches in diameter, and 18 inches deep in the soft mud. No. 3, weight 853 grams, fell in an open field on Mrs. Trutter's place, making a hole some 4 inches to 6 inches wide and 6 to 8 inches deep. No. 4, weight 1,114 grams, fell near a colored burial ground near the Seaboard Airline Railroad tracks and was seen by 50 to 75 colored people.

The appearance of the four individuals is shown in Plates 1, 2, and 3. No. 1 shows both primary and secondary encrustation; No. 2 is

evenly encrusted excepting where broken away in striking; Nos. 3 and 4 (pl. 3) are both well encrusted, but 4 shows a secondary crust on the upper surface, not shown in the figures.

The texture is quite uniform and plainly chondritic. The individual shown in Figure 1, Plate 3, was cut in halves and from the central portion was selected the material for analysis and sections.

In the thin section the stone shows a structure and composition common to those of its class—a confused, often obscure tuffaceous ground carrying indistinct chondritic forms of both olivine and pyroxene, as a rule not sharply differentiated from the ground but showing irregular and finely granulated borders due to crushing and of the nature that has given rise to the supposition—by some—that the apparent tuffaceous nature of chondritic stones is really cataclastic through shock or compression.

The pyroxenes give, in most cases, extinctions parallel to the vertical axes; occasional larger forms have extinction angles as high as 12 to 15 degrees, and hence are assumed to be clinoenstatite. Rarely occurs a small, irregular, colorless area without cleavage lines which might readily be assumed to be an undifferentiated residual glass but that it polarizes in light and dark colors and is therefore considered a maskelynite. That merrillite or apatite—or both—is present is indicated by a phosphoric-acid test but neither mineral was recognized microscopically. No trace of oldhamite or other unusual minerals could be detected.

The stone shows a rusty black, lusterless crust and on a freshly broken surface is of an ash-gray color which quickly becomes covered with rusted spots. Dark chondrules ranging in sizes in one instance up to five millimeters are abundant as are also small flakes of metal. As a rule the chondrules break free from the matrix. I have classed the stone as a spherulitic chondrite (Cc).

The results of chemical investigation by Earl V. Shannon are given below.

The composition of the whole stone is as follows:

	Per cent
Metal .....	6.46
Soluble silicates .....	52.71
Insoluble silicates .....	40.83
Total .....	100.00

The composition of the metal is as follows:

	Per cent
Iron .....	87.61
Nickel .....	12.13
Cobalt .....	.64
Copper .....	.07
Total .....	100.45

The soluble silicate gave the following:

	Per cent
SiO <sub>2</sub> .....	29. 10
Al <sub>2</sub> O <sub>3</sub> .....	. 43
FeO .....	34. 04
CaO .....	. 44
MgO .....	32. 97
NiO .....	. 30
S <sup>1</sup> .....	2. 16
P <sub>2</sub> O <sub>5</sub> .....	. 43
Total .....	99. 87

The insoluble silicate was found to have the following composition:

	Per cent
SiO <sub>2</sub> .....	55. 89
Al <sub>2</sub> O <sub>3</sub> .....	6. 78
FeO .....	10. 79
CaO .....	2. 70
MgO .....	21. 72
NiO .....	None.
CrO <sub>3</sub> .....	. 22
MnO .....	Trace.
Na <sub>2</sub> O .....	1. 21
K <sub>2</sub> O .....	. 64
Total .....	99. 95

The composition in terms of the meteorite as a whole is:

	Per cent
SiO <sub>2</sub> .....	38. 16
Al <sub>2</sub> O <sub>3</sub> .....	3. 00
FeO .....	22. 35
CaO .....	1. 35
MgO .....	26. 25
NiO .....	. 16
CrO <sub>3</sub> .....	. 09
MnO .....	Trace.
Na <sub>2</sub> O .....	. 49
K <sub>2</sub> O .....	. 26
P <sub>2</sub> O <sub>5</sub> .....	. 23
Fe .....	5. 66
Co .....	. 041
Ni .....	. 78
Cu .....	. 005
S .....	1. 14
Total .....	99. 966

Concerning the methods employed in these analyses, Mr. Shannon says:

Fragments of the stone, free from crust, to the weight of 32 grams, were ground to pass a 12-mesh screen. This sample was thoroughly mixed and a 5-gram portion was ground to pass 80 mesh, and all magnetic particles were removed from it by repeatedly working over the sample with a hand magnet.

<sup>1</sup> Due doubtless to admixed troilite.

This metallic portion was digested in a hot solution, saturated, of mercuric chloride, whereupon the metal went into solution. The undissolved silicate was filtered out and weighed. The solution, after being freed from mercury, was analyzed by the standard methods, giving the composition of the metallic portion.

The silicates were thoroughly mixed and a 2-gram portion weighed into a casserole, covered with 200 c. c. of 1:1 hydrochloric acid and evaporated to dryness on the steam bath. The residue was then moistened with a mixture of nitric and hydrochloric acids to decompose any cohenite or schreibersite, again evaporated to dryness, taken up in hydrochloric acid and filtered. The residue, after thorough washing with hot water, was digested on the steam bath with 10 per cent sodium carbonate solution. This was again filtered and washed with hot water until free from alkali, then rinsed once with hydrochloric acid and washed free from acid. The acid and alkali extracts were united, evaporated to dryness, and analyzed by standard methods, giving the composition of the soluble silicate portion. The residue on the filter was weighed as insoluble silicate and analyzed by standard methods to give the composition of the insoluble silicate. Sulphur was determined by the standard method in a separate portion and assigned to the soluble portion. Alkalies were determined on another separate sample of the powder and relegated to the insoluble silicate.

The results of the analyses as given above are fairly typical for stones of the class. So far as relative proportion of metal and silicates, and composition of the metal are concerned, the results are in close agreement with those obtained by Whitfield on the stone of Elm Creek, Kans.<sup>2</sup> The metal content, it will be observed, is below the average (11.98%) of stony meteorites as given in the paper quoted. The ratio of metal to nickel is about 7 to 1, and that of magnesia (MgO) to ferrous oxide (FeO) in the magnesium silicates but 1 to 1. These facts are of interest in connection with generalizations that have been made on the subject.<sup>3</sup>

#### EXPLANATION OF PLATES

##### PLATE 1

Two views of the largest individual. Actual size about 13 by 10 by 9.5 cm.; weight, 2,250 grams. Shows primary and secondary encrustation.

##### PLATE 2

Two views of second largest stone. Actual size, 13 by 7 by 7 cm.; weight, 1,850 grams.

##### PLATE 3

The two smaller stones. Fig. 1: Size, 7 by 10 by 6 cm.; weight, 1,114 grams. Fig. 2: Size, 7 by 9 by 6 cm.; weight, 850 grams.

<sup>1</sup>Mem. Nat. Acad. Sci., vol. 14, 1916, pp. 15-16.

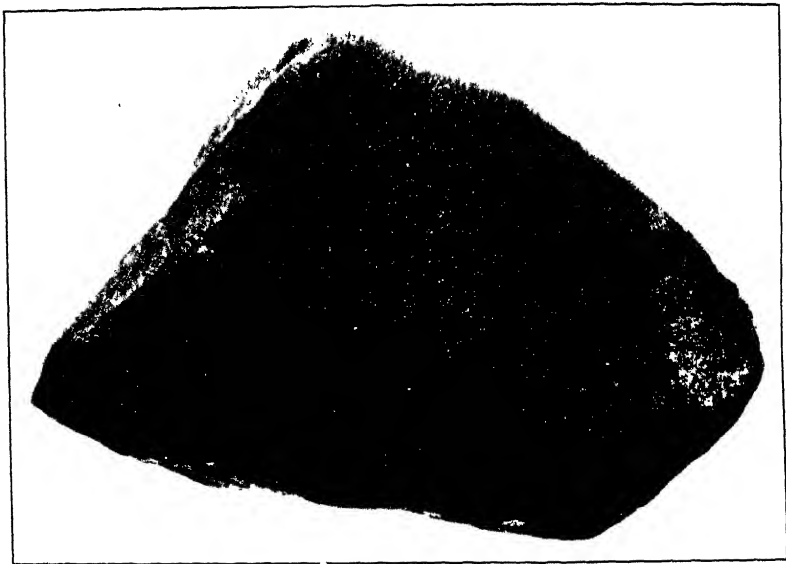
<sup>2</sup>Mineralogical Magazine, vol. 18, Nov., 1916, pp. 26-44



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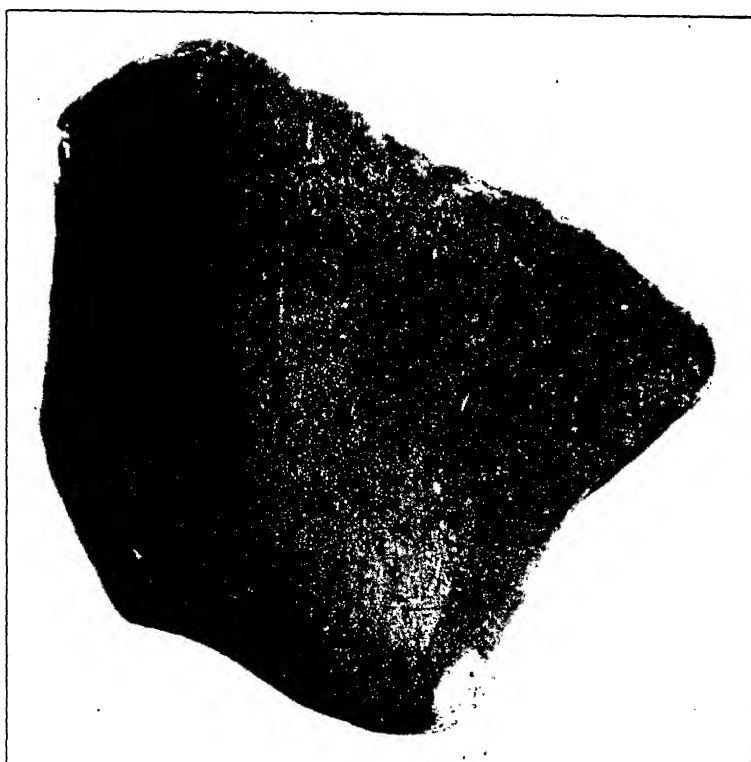
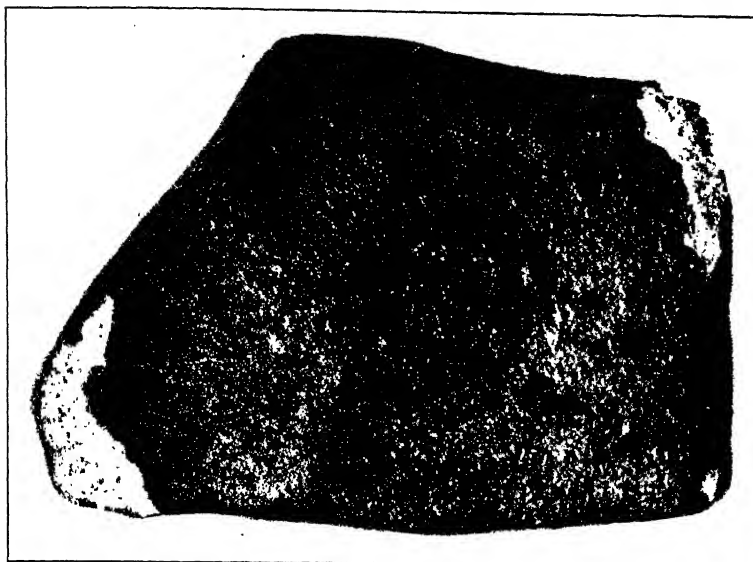
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# RICHMOND FAUNAL ZONES IN WARREN AND CLINTON COUNTIES, OHIO

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Previous to 1897, when Winchell and Ulrich first used the term "Richmond Group" to designate the uppermost formation of the Cincinnati series as then considered, no careful or extended work had been undertaken for the purpose of determining the vertical range and variation of its fossils, or to establish the boundaries or lithological characters of its subdivisions. Before that date writers, in describing new species from these strata, made no attempt to designate their exact position in the series, although, as is the case with some of these species, their vertical range does not exceed a very few feet. In almost all of these early descriptions of Richmond fossils the general statement that the particular species under discussion was from the upper part of the Hudson River group was considered sufficiently explicit.

As a result of later investigations during the last thirty years by such careful observers as Ulrich, Nickles, Foerste, Bassler, Cumings, and Shideler, the boundaries of the various subdivisions of the Richmond have been established and the vertical range of many of its species accurately determined. Also in the case of many of the species which first made their appearance in this region during the deposition of the Richmond rocks, much progress has been made in determining their previous habitat and the lines along which they extended their range into this territory. The writer has spent half a century in such studies and with the recent gift of his collection of Early Silurian fossils to the United States National Museum, it was thought fitting that some of his observations be put on record.

In the present paper it is our purpose first to call attention to a factor which we believe exerted a more potent influence in bringing about the many and often abrupt lithological and faunal changes met with in the Richmond than any other cause of which we now have knowledge. This factor was the oscillation of the sea floor

with the resulting frequent and often considerable change in sea depth which there is ample evidence to show took place during the upbuilding of these strata. As in the seas of the present day we have littoral, off-shore and deep-water species whose range is largely determined by sea depth, and still other species which have the exceptional power of adapting themselves to a very considerable change in depth and other conditions, so in the ancient seas, life appears to have been subjected to the same laws of distribution. Then, as now, some species were evidently restricted to waters of so little depth that they were exposed at all times to the full force of the tides and waves; others to seas though always comparatively shallow during the period, yet of such depth that the agitation of their surfaces seldom if ever extended down to their floors or disturbed objects reposing upon them. In these shallow seas the remains of only such forms as possessed a skeleton sufficiently compact to withstand a long continued hammering in the surf after death, came through intact, as for instance the bryozoans, the thick-shelled species of brachiopods and gastropods and the true corals, while on the other hand the shells of all the frailer forms after the death of their occupants, were broken into fragments and these fragments were usually worn smooth and scattered widely about by the waves before the process of attrition was brought to an end by their being finally covered up in the mass of débris accumulating on the sea floor. It can be further said of these shallow sea deposits that the shells of such bivalves as escaped destruction usually present the evidences of erosion and as a rule have their valves separated and lying widely apart. Also in those beds, species whose skeletons were made up of a multitude of segments, as the trilobites, the crinoids, and the starfishes, have almost without exception had these coverings separated after death into their component parts and these parts scattered by the waves. This statement is especially true of some species of the genus *Acidaspis* whose range appears to have been restricted to very shallow waters. Although abundant during the Richmond, the constant turmoil of the waters in which they lived and died, left only these fragments to be preserved in the rocks. The same generally is true of the genus *Lichenocrinus* where only the solid modified root remains. Although it is generally conceded that the Richmond seas at no time attained abyssal depths and that all times its waters were comparatively shallow, there are good reasons for believing that not only once but many times during that period its waters deepened to such an extent their floors were no longer much affected by currents set in motion by forces acting upon their surfaces. As evidence of this we meet with beds usually of shale or marl in which the most delicate forms have been preserved

intact and in the same position they were in when death overtook them. That these frail forms were thus so fully preserved by reason of the unbroken quiet of the waters about them and not because they were at once buried after death in the rapidly accumulating clay before their soft parts had time to disintegrate is proved by evidence often furnished by their fossil remains in the form of parasitic growths on their surfaces. In many instances after the death of these animals some parasitic species, such as an incrusting bryozoan, established its colony on the empty shell, reached maturity and died to be succeeded not infrequently by a second and different parasitic species which likewise had full time to complete its life cycle before all were finally covered by the accumulating clay.

Although the oscillations of the Richmond sea floor were many, the extremes in depth to which we have referred were not the usual outcome of these disturbances, since in most instances the changes stopped well within those limits. Yet a change from one to the other of those extremes did occur a number of times during the upbuilding of the group, and occasionally, as we shall see further on, quite abruptly, as measured by geologic time. At the horizons where these oscillations are recorded in the rocks a half-dozen feet in the vertical scale will in some instances take one from strata laid down in the quiet of deep water to other strata, whose broken and water-worn fossils indicate that they were formed in a shallow sea whose floor was subjected to the full force of the waves. While the character and conditions of the sediments of the Richmond seas were greatly affected by these oscillations, a still greater influence was exerted on its fauna. The species of the deep-water beds are almost all different from those met with in the shoal-water beds and so, to a lesser degree, do both differ from the life of the intermediate strata. As a rule, lamellibranchs greatly outnumber all other classes in the deep-sea beds, while in those formed in shallow waters the brachiopods and bryozoans are the predominating forms. Since by far the greater part of the Richmond species appear to have had their range determined by sea depth, and as many of these species, like the *Hebertella insculpta*, seems to have been unable to survive any considerable change in that condition, the oscillations that so frequently resulted in the deepening or shoaling up of the Richmond sea undoubtedly exerted a powerful influence on the life of its waters. Whether the sea floor was rising or sinking, every step in the change was reflected by a corresponding change in the fauna of the time. Single species, and at times whole groups of species, were forced to retire from the disturbed area since the change had rendered its waters untenable. These disappearing species were at once succeeded by other species adapted to the new conditions and these in

turn by still other forms, and so on till the disturbance had reached its end. If the movement in turn was reversed as when a period of elevation succeeded one of subsidence, so in a reversed order many of the old species much changed in form reappear as the conditions necessary to their existence returned. As a result of the changes these disturbances produced we usually find at those horizons where the strata record a considerable change in depth an unusually rich and varied fauna. These species, ranging from the deep-water forms through all the intermediate types to those restricted to the turbulent water of a shallow sea, may follow each other in such rapid succession that all may be collected in a vertical range of a few feet.

What should also be referred to in this connection is the remarkable fact that it was only during these periods of oscillation that new species made their first appearance in the Richmond seas and that these horizons where the changes were considerable, the beginning of the change is marked by the presence of exceptionally heavy layers of hard, fine-grained clay stone, formed apparently from sediment brought in by currents from a distance. Then it was also during these times of change that numerous old forms which had flourished earlier in the Ordovician seas either during the Trenton, the Cincinnati proper, or earlier in the Richmond reappear to be for a time a part of its fauna. Although, not infrequently, species long established in the Richmond seas degenerated, grew scarce, and finally wholly disappeared during a period of prolonged stability we would repeat that as far as our observation has gone, no new species appeared or old species reappeared in these waters at any other time than during the periods of disturbance caused by the rising or sinking of the sea floor.

Another interesting fact relating to the fauna that should be mentioned before we take up the consideration of the Richmond strata in detail is the marked effect these changes in depth had upon the size and form of the individuals of such species as passed through them. Notable among the species that were able to survive extreme variations of this nature is the *Rafinesquina alternata* and to a less degree the *Hebertella occidentalis* group and the *Platystrophia*s. Taking the changes in these forms as an index, it can be stated as a general rule that brachiopods which grew in shallow turbulent waters developed a much thicker shell than those in deeper stations, their brachial valves were more highly arched, the lines of growth more frequently present and strongly developed, and there was a marked tendency to a strengthening of the hinge line much beyond the average. On the other hand in deep water these species developed much flatter and thinner shells than the average, had few if any lines of growth, but frequently became unusually elongated along

the hinge line. Again during a number of these periods of disturbances, conditions appear to have developed that were extremely favorable to the growth of one or more of the species then existing. At several horizons where a considerable oscillation of the sea floor is indicated we find one or more of the species present so overgrown as to appear as veritable giants of their kind when compared with specimens from other levels. In other instances the change was equally unfavorable to some species and we then see the individuals greatly dwarfed, although later under better conditions they usually regained their normal size.

In the Richmond seas one species at least, *Plectambonites rugosus* seemed to have thrived best in the unsettled conditions that marked the close of one period and the ushering in of the next. Its first appearance in the group is at the beginning of the Clarksville division before the change that brought that division into existence had ceased to act. There in the varietal form known as *P. rugosus clarksvillensis* it occurs in unusual numbers and of great size. Again on the heavy clay stones that marks the base of the Liberty and higher up where a similar heavy layer marks the beginning of the Whitewater, remains of countless millions of the species are to be found although the shell is not especially common at other horizons.

In preparing the following notes and geologic section, we have confined our statements almost wholly to the small area lying chiefly within the counties of Warren and Clinton in Ohio, east of the Little Miami River, because it is the region with which we are most familiar, having passed our entire life within its limits and many times each season visiting its exposures through a period exceeding 50 years. In referring to the divisions of the Richmond in the following pages, we are aware that the changes there suggested will probably be called in question. Yet we can say in this connection that these changes have not been made lightly, but only after a careful study of the junction of these divisions extending through many years, and made at practically all the exposures in this territory where they are to be seen and that if we desire accuracy, such changes must be made.

These repeated examinations have convinced us that in addition to the changes produced in the current life, and on the character of the sedimentary deposits, by changes in sea depth, which apparently were frequent and at times considerable—there were other powerful forces occurring entirely outside of this region, which exerted a greater influence than all others in determining the general changes that took place in the Richmond seas. Apparently these outside disturbances affected the existing life and developing strata in two distinct ways; first by turning loose at times floods of argillaceous material which not only greatly affected life, usually modifying or



destroying it, but also deposited more or less heavy beds of nodular clay stone or more frequently one or more compact clay stone layers, thicker and quite different in character from those common to the group and second, by the breaking down of previous barriers, thus opening the way for the entrance of the many new species which appear abruptly in the Richmond strata just above or more rarely below these peculiar argillaceous deposits. Thus we are convinced that the changes produced in our Richmond seas by these outside disturbances were largely responsible for those differences which have made it necessary, or at least convenient to divide the group into its present recognized divisions and that those peculiar clay stone layers truly indicate the natural lines of demarkation between them. With one exception, the point of contact between the Fort Ancient and Clarksville, the lines of junction between all the divisions are clearly marked in this region by the presence of these unusual argillaceous deposits.

In conclusion we would say that the following lists lack much of being complete. There is quite a number of species in the group which have not been named and described, others present are so rare in their occurrence that we have failed to find them in this territory, while many more in such classes as the bryozoans and gastropods we have not been able to identify.

Again, in attempting to find out the vertical range of the various species of a division or of a group, one is certain to meet with the greatest difficulties if they are attempting a reasonable approach to accuracy. In numerous cases an individual may be unexpectedly found much below or far above where the species attains its full development in numbers. Other species, though present in the group are so rare that one is lucky to find a single specimen during a lifetime search. Still other species were restricted in life to widely scattered colonies, the remains of which may not through long periods be uncovered at any of the exposures in the territory.

Our classification of the Richmond strata in this area is given in the following composite section:

COMPOSITE SECTION OF THE RICHMOND GROUP IN WARREN AND CLINTON COUNTIES, OHIO

*Elkhorn formation (Beds E. 1-3)*

- Upper division (E. 3). Blue clay, unfossiliferous except that a few layers 15 feet above the base contain *Cyphotrypa stidhami* and *Otenodonta hilli* in abundance and the top stratum holds the species of annelids described by Foerste..... 42'
- Middle division (E. 2). Thin bedded blue limestone with a few clay layers containing *Homotrypa wortheni prominens*, *Platystrophia moritura*, *Opisthoptera casei*, and *Lichenocrinus tuberculatus* with *Streptelasma rusticum*, *Protarea richmondensis*, and other longer ranging fossils..... 4'
- Lower division (E. 1). Fossiliferous blue clay with *Ischyrodonta elongata*, *I. miseneri*, *Bellerophon mohri*, etc..... 2'

## Whitewater formation (Beds Wh. 1-6)

## Oakland division (Beds Wh. 3-6) :

*Drepanella richardsoni* bed (Wh. 6). Light-colored clay capped by two or three heavy layers of impure limestone 8 to 10 inches thick apparently barren but crowded with ostracoda, *Drepanella richardsoni*, *Eurychilina striatmarginata*, *Leperditia caecigena*, *Primitia lativia*, etc., *Lichenocrinus tuberculata*, *Agelacrinus austini*, and *Helopora elegans* also present ----- 5'

*Ischyrodonta* bed (Wh. 5). Alternating thin bedded blue limestone and clay layers, the latter predominating with the upper beds containing great number of *Ischyrodonta decipiens*, *I. elongata*, *I. miseneri*, *I. ovalis*, and *Otenodonta hilli* ----- 6'

*Monticulipora cleavelandi* bed (Wh. 4). Shelly limestone layers crowded with ramose bryozoa particularly *M. cleavelandi* and *Homotrypa austini* ----- 3'

Lower bed (Wh. 3). Nodular clay limestone with the interspaces filled with coarse clay. *Dermatostroma glyptus*, *Bellerophon mohri*, *Lichenocrinus tuberculatus*, *Strophomena sulcata*, *Hebertella occidentalis*, *Rafinesquina*, etc., present ----- 6'

Middle division (Wh. 2). Alternating clay and limestone layers with the latter predominating. The clays are almost unfossiliferous, the species present being attached to the limestone beds ----- 50'

Lower division (Wh. 1). Clay shale and occasionally layers of limestone containing an unusual number of species, among them *Homotrypa wortheni*, *Ptilodictya magnifica*, *Pachydictya fenstelliformis*, *Monticulipora parasitica*, *Xenocrinus baeri*, *Gyroceras baeri*, *Arctinurus harrisi*, *Gomphoceras eos*, and *Byssonychia richmondensis*, while *Streptelasma rusticum* is especially abundant and large in the lower part. Base marked by one or more unusually thick clay-stone layers, with *Plectambonites rugosus clarksvillensis* in great abundance ----- 10'

## Liberty formation (Beds L. 1-3)

Upper beds (L. 3). Thick clay beds interspersed with rather thin (2 to 5 inches), even-bedded limestone layers abundantly fossiliferous but with the fossils usually attached to the limestone.

*Constellaria limitaris* bed (L. 2.) Fossiliferous clays and thin-bedded limestone holding *Constellaria limitaris* in abundance associated with *Gyroceras baeri*, *Cupulocrinus polydactylus*, *Dinorthis subquadrata*, *Phragmolites dyeri*, *Dalmanites breviceps*, etc. With these normal-sized species are dwarf forms of *Plectambonites rugosus clarksvillensis*, *Strophomena planumbona*, *Pterinea demissa*, and *Calymene meeki* ----- 10'

Basal beds (L. 1). Heavy clay-stone layers marking base of Liberty.

## Waynesville formation (Beds W. 1-17)

## Blanchester division (Beds W. 8-17) :

Crinoid bed (W. 17). Compact, fine grained green blue clays with the crinoids *Glyptocrinus forshelli*, *Canistrocrinus richardsoni*, *Compsocrinus miamiensis*, *Dendrocrinus casei*, *Reteocrinus nealli*, and *Heterocrinus juvenis* and the merostome *Megalograptus welchi* ----- 6'

Upper *Hebertella insculpta* bed (W. 16). Shaly limestone layers crowded with *Hebertella insculpta*, *Strophomena nutans*, *S. neglecta*, and other brachiopods in abundance, attached to the limestone ----- 5'

## Blanchester division—Continued.

- Coral bed (W. 15). Rather barren blue clay with a few even-bedded limestone layers showing fossils upon their surface. *Calapoecia oribri-formis*, *Columnaria alveolata*, *O. vacua*, and *Tetradium* occur in the clay, while *Plectorthis* (*Austinella*) *scovillei* is found only in a thin limestone bed in the middle of the division..... 8'
- Upper disturbed layers (W. 14). Two layers, each about 6 inches thick, of disturbed material, chiefly shells of *Rafinesquina alternata* standing on edge. These two beds are separated by a foot of undisturbed shale and limestone. *Rhynchotrema dentatum* rare in the lower disturbed bed, its only occurrence in the Richmond of this area..... 2'
- Homotrypa dawsoni* beds (W. 13). Compact blue clay, bearing an occasional thin limestone layer, with *Homotrypa dawsoni*, the most common fossil. *Mastigograptus gracillimus* and *Ateleocystites balanoides* also present..... 3'
- Strophomena nutans* bed (W. 12). Thin shelly limestone crowded with *Strophomena nutans* and *S. neglecta*, also with specimens of *S. planumbona elongata*..... 4-5'
- Platystrophia annieana* bed (W. 11). Even-bedded layers of limestone and shale with *Platystrophia annieana*, *Reteocrinus nealli*, and *Streptelasma dispanum* appearing for the first time..... 3'
- Lower disturbed layer (W. 10). Shaly limestone layers 6 inches thick filled with valves of *Rafinesquina alternata* standing on end, underlaid by one foot of clay and thin limestone with few fossils..... 1.5'
- Isotelus gigas* bed (W. 9). Compact blue clay abounding in well-preserved fossils, particularly pelecypods (*Opisthoptera*, *Psilooncha*, *Cuneamya*, etc.), and containing entire specimens of *I. gigas* more abundantly than at any other horizon..... 3'
- Basal beds (W. 8). Claystone and shale with many long ranged species. *Dalmanella meeki*, *Plectambonites rugosus clarksvillensis*, and *Zygospira modesta* noted..... 7'
- Clarksville division (Beds W. 5-7):
- Lower *Hebertella insculpta* bed (W. 7). Blue limestone and shale like that at base (W. 5) but containing *Hebertella insculpta*, *Protarea richmondensis* and *Pterinea corrugata*, *Catazyga headi schuchertana*, *Dinorthis carleyi-insolens*, etc. A heavy compact argillaceous layer up to 7 inches thick forms the capstone to this bed with *Dalmanella meeki* in abundance..... 3'
- Middle beds (W. 6). Lumpy, dark blue, rubbly limestone mingled with granular, dark blue clay containing broken and waterworn shell fragments, particularly *Dalmanella meeki* and holding many minute fossils (*Cyclora*, etc.)..... 9'
- Plectambonites clarksvillensis* bed (W. 5). Rather even bedded blue limestone and shale with first appearance of *Streptelasma rusticum*, *Plectambonites rugosus clarksvillensis*, *Rhynchotrema capax*, *Strophomena sulcata*, *S. planumbona*, and crowded with *Dalmanella meeki*..... 3'
- Fort Ancient division (Beds W. 1-4):
- Orthoceras fosteri* bed (W. 4). Soft, dove colored clay with many fossils especially *Orthoceras fosteri*, *Calymene meeki*, *Paleschara beani*, *Cyphotrypa clarksvillensis*, *Suecocras inequabile*, *Columnaria alveolata*, *Tetradium*, *Stromatocerium ohioensis*, *Spatiopora tuberculata*, etc..... 5'

## Fort Ancient division—Continued.

- Anomalodonta gigantea* bed (W. 3). Purer blue limestone beds interbedded with shale, with many pelecypods, particularly *Anomalodonta gigantea*, *A. alata*, *Pholadomorpha pholadiformis*, *Pterinea demissa*, etc., at their greatest development.----- 12'
- Rafinesquina lozorhytis* bed (W. 2). Argillaceous blue limestone beds alternating with more or less heavy layers of shale. Fossils rather few, *R. alternata*, *R. lozorhytis*, *Dalmanella meeki*, etc.----- 40'
- Strophomena concordensis* bed (W. 1). Massive, nodular, light blue argillaceous limestone with little clay, rather unfossiliferous but containing *Strophomena concordensis*, *Cyclonema humerosum*, *Anomalodonta alata*, and *Rafinesquina* species.----- 5'

## Arnheim formation (Beds A. 1-3)

## Oregonia division (Beds A. 2, 3).

- Homotrypa bassleri* beds (A. 3). Dark blue shales and lumpy, rubbly, argillaceous limestone crowded with fossils; *Cyclonema fluctuatum*, *Anomalodonta alata*, *A. gigantea*, *Mesotrypa orbiculata*, *Homotrypa bassleri*, *Batostoma varians*, and many microscopic fossils (species of *Cyclora*, *Primitia cincinnatensis*, *Bollia regularis*, *Otenobolbina hammett*, *Aparchites oblongus*, etc.)----- 20'
- Dinorthis carleyi* bed (A. 2). More even bedded blue limestone alternating with beds of clay with valves and entire examples of this characteristic species and also *Leptaena richmondensis precursor* and *Platystrophia ponderosa*.----- 3'-5'

Sunset division (A. 1). Rather unfossiliferous, light drab colored clays alternating with thin layers of clay stone of the same color, which contrasts strongly with the Mount Auburn beds below and the Oregonia above. *Rafinesquina alternata* var. common at the bottom and near the top. *Cyclonema fluctuatum*, *Peronopora decipiens*, and *Pterinea demissa* usually found.----- 20'

## Maysville Group (Ordovician).

## RICHMOND FOSSILS IN WARREN AND CLINTON COUNTIES, OHIO, SHOWING STATIGRAPHIC RANGE

- Acrolichas shideleri* (Foerste), Wh. 1.
- Agelacrinus austini* Foerste, Wh. 6.
- Agelacrinus rectiradiatus* (Williams), L. 3.
- Anomalodonta alata* (Meek), A. 3, W. 2.
- Anomalodonta gigantea* Miller, A. 3, W. 2.
- Aparchites minutissimus* (Hall), A. 3.
- Aparchites oblongus* Ulrich, A. 3.
- Arabellites procursus* Foerste, E. 3.
- Archinacella richmondensis* Ulrich, Wh. 5.
- Arctinurus harrisi* (Miller), Wh. 1.
- Arthraria biclavata* Miller, A-E.
- Arthropora shafferi* (Meek), W. 3, 8, Wh. 2, 5, 6.
- Arthropora shafferi*, var. *robusta* Ulrich, L. 2.
- Atactopora angularis* Ulrich and Bassler, W.
- Atactoporella schucherti* Ulrich, W.
- Ateleocystites balanoides* (Meek), W. 13.
- Batostoma variabile* (Ulrich), Wh. 4.
- Batostoma varians* (James), W. 3, 5, 6, 8; A. 3.
- Bellerophon mohri* Miller, Wh. 3, E. 1.

- Berenicea primitiva* Ulrich, Wh. 3-6.  
*Bollia persulcata* Ulrich, A-E.  
*Bollia pumila* Ulrich, W.  
*Bollia regularis* (Emmons), A. 3.  
*Brachiospongia tuberculata* (James), L. 3.  
*Bucania simulatrix* Ulrich, Wh. 1.  
*Buthotrephis gracilis* Hall, A-E.  
*Byssonychia cultrata* Ulrich, W. 3, 4, 9.  
*Byssonychia grandis* Ulrich, W. 3, 4.  
*Byssonychia cf. radiata* (Hall), A-E.  
*Byssonychia richmondensis* Ulrich, Wh. 1, 2.  
*Byssonychia subrecta* Ulrich, W. 4, 9, Wh. 1.  
*Byssonychia tenuistriata* Ulrich, Wh. 5.  
*Bythocypris cylindrica* (Hall), A-E.  
*Bythopora delicatula* (Nicholson), Wh. 2, 4, L. 2, Wh. 5, 6.  
*Bythopora meeki* (James) W. 3, 5, 8, 9. Wh. 2, L. 2.  
*Bythopora striata* Ulrich, A., W., L. 2, Wh. 2.  
*Calapoecia cribriiformis* (Nicholson), W. 9, 15.  
*Calloporella circularis* (James), W.  
*Calymene meeki* Foerste, A-E.  
*Calymene meeki retrorsa* Foerste, Wh. 1.  
*Canistrocrinus richardsoni* (Wetherby), W. 17.  
*Catazyga headi schuchertana* Ulrich, W. 7.  
*Ceramoporella granulosa* Ulrich, A-E.  
*Ceramoporella ohioensis* (Nicholson), A-E.  
*Ceramoporella whitei* (James), A. 3.  
*Ceratopsis robusta* (Ulrich), A-E.  
*Ceraurinus icarus* (Billings), Wh. 1.  
*Clathrospira subconica* (Hall), E. 1.  
*Clidophorus fabula* (Hall), A-E.  
*Coleolus iowensis* James, A-E.  
*Columnaria alveolata* (Goldfuss), W. 4, 7, 15.  
*Columnaria vacua* Foerste, W. 16, 15.  
*Compsocrinus harrisi* (Miller), W. 17.  
*Compsocrinus miamiensis* (Miller), W. 17.  
*Constellaria limitaris* (Ulrich), L. 2, W. and Wh.  
*Constellaria polystomella* Nicholson, W. 17 Wh., E.  
*Conularia formosa* (Miller and Dyer), W. 4.  
*Corallidomus concentricus* Whitfield, W. 9.  
*Cornulites richmondensis* (Miller), W. 2, 4, S.  
*Corynotrypa delicatula* (James), A-E.  
*Corynotrypa inflata* (Hall), A-E.  
*Crania laelia* Hall, A-E.  
*Crania scabiosa* Hall, A-E.  
*Ctenobolbina hammelli* (Miller and Faber), A. 3.  
*Ctenodonta albertina* Ulrich, W. 3, 9.  
*Ctenodonta hilli* (Miller), Wh. 5, E. 3.  
*Ctenodonta obliqua* (Hall), A-E.  
*Cuncamya curta* Whitfield, W. 9.  
*Cuncamya miamiensis* Hall and Whitfield, W. 3, 4, 9.  
*Cuncamya neglecta* (Meek), W. 4, 9, A. 3.  
*Cuncamya scapha* Hall and Whitfield, W. 9.  
*Cupulocrinus polydactylus* (Shumard), Wh. 1, L. 2.

- Cyclonema bilix* (Conrad), W. 2, 5, 6, 8, 13.  
*Cyclonema fluctuatum* (James), A. 1-3, W. 5.  
*Cyclonema* cf. *humerosum* Ulrich, W. 1, A. 3.  
*Cyclora depressa* Ulrich, A-E.  
*Cyclora hoffmani* Miller, A-E.  
*Cyclora minuta* Hall, A-E.  
*Cyclora parvula* (Hall), A-E.  
*Cyclora pulcella* Miller, A. 3.  
*Cymatonota constricta* Ulrich, W. 3, 4, 9.  
*Cymatonota cylindrica* (Miller and Faber), W. 3, 4, 9.  
*Cymatonota semistriata* Ulrich, W. 4, 9.  
*Cymatonota typicalis* Ulrich, W. 4, 9.  
*Cyphotrypa clarksvillensis* Ulrich, W. 4.  
*Cyphotrypa stidhami* (Ulrich), E. 3.  
*Cyrtoceras faberi* James, W. 4.  
*Cyrtoceras tenuiseptum* Faber, W. 4.  
*Cyrtolites ornatus* Conrad, W. 3, 9, Wh. 2.  
*Dalmanella meeki* (Miller), W. 2, 4, 6, 8.  
*Dalmanites breviceps* (Hall), Wh. 1, L. 2.  
*Dendrocrinus caduceus* (Hall), W. 17.  
*Dendrocrinus casei* Meek, W. 17.  
*Dermatostroma corrugatum* (Foerste), Wh. 5.  
*Dermatostroma glyptum* (Foerste), Wh. 3.  
*Dermatostroma papillatum* (James), A-E.  
*Dermatostroma scabrum* (James), W. 2.  
*Dicranopora fragilis* (Billings), L. 2.  
*Dinorthis carleyi* (Hall), A. 2.  
*Dinorthis carleyi insolens* Foerste, W. 7.  
*Dinorthis subquadrata* (Hall), L. 2, Wh. 1, 2.  
*Drepanella richardsoni* (Miller), Wh. 6.  
*Endoceras proteiforme* (Hall), Wh. 1, 3, 4, Wh. 3.  
*Eridotrypa simulatrix* (Ulrich), W.  
*Eunicites confinis* Foerste, E. 3.  
*Eunicites falcatus* Foerste, E. 3.  
*Eunicites paululus* Foerste, E. 3.  
*Eurychilina striatomarginata* (Miller), Wh. 6.  
*Fenestella granulosa* Whitfield, Wh.  
*Glyptocrinus? fornsheilli* Miller, W. 17.  
*Gomphoceros eos* Hall and Whitfield, Wh. 1.  
*Gyroceras baeri* (Meek and Worthen), Wh. 1, L. 2.  
*Hallopora frondosa* (Cumings), W.  
*Hallopora subnodosa* (Ulrich), W. L. 2.  
*Hebertella alveata* Foerste, Wh. 1, 2, 5, 6.  
*Hebertella alveata richmondensis* Foerste, E-2.  
*Hebertella insculpta* (Hall), W. 7, 16.  
*Hebertella occidentalis* Hall, W. 3, 5, 8, 16, L. 2, Wh. 1-6, E. 3.  
*Hebertella occidentalis sinuata* (Hall), W-E.  
*Helopora elegans* Ulrich, Wh. 6.  
*Helopora harrisi* James, W. L. 2.  
*Heterocrinus juvenis* (Hall), W. 5, 17.  
*Heterotrypa subramosa* (Ulrich), W.  
*Heterotrypa subramosa prolifica* Ulrich, W. 13.  
*Homotrypa austini* Bassler, Wh. 4.

- Homotrypa bassleri* Nickles, A. 3.  
*Homotrypa communis* Bassler, W.  
*Homotrypa cylindrica* Bassler, Wh.  
*Homotrypa dawsoni* (Nicholson), W. 13.  
*Homotrypa flabellaris* Ulrich, W. 3.  
*Homotrypa flabellaris spinifera* Bassler, Wh.  
*Homotrypa libana* Bassler, A. 3.  
*Homotrypa wortheni* (James), E. 2, Wh. 1, 2.  
*Homotrypa wortheni prominens* Bassler, E.  
*Homotrypella (Prasopora) hospitalis* (Nicholson), W. Wh. L  
*Hormotoma gracilis* (Hall), W. 2.  
*Hyalithes? dubius* Miller and Faber, A. 3, W. 3.  
*Iocrinus subcrassus* Meek and Worthen, E-2.  
*Ischyrodonta decipiens* Ulrich, Wh. 5.  
*Ischyrodonta elongata* Ulrich, Wh. 5, E. 1.  
*Ischyrodonta miseneri* Ulrich, E. 1, Wh. 5.  
*Ischyrodonta ovalis* Ulrich, Wh. 5.  
*Ischyrodonta truncata* Ulrich, Wh. 4, 5.  
*Isotelus brachycephalus* Foerste, W. 9, 16, 17.  
*Isotelus gigas* DeKay, A-E.  
*Isotelus maximus* (Locke), A-E.  
*Leperditia caecigena?* Miller, Wh. 6.  
*Lepidocoleus jamesi* (Hall and Whitfield), W. 3.  
*Leptaena richmondensis* Foerste, E. 2.  
*Leptaena richmondensis precursor* Foerste, A. 2.  
*Leptotrypa cf. ornata* Ulrich, W. 7.  
*Licclelmella subfusiformis* (James), L. 2.  
*Lichenocrinus affinis* Miller, W. 7, 8, 16.  
*Lichenocrinus tuberculatus* Miller, Wh. 3, 5, 6, E. 2.  
*Lingula vanhorni* Miller, W. 3, W. 16.  
*Liospira vitruvia* (Billings), W. 2-4, 9.  
*Lophospira bowdeni* (Safford), A-E.  
*Lophospira tropidophora* (Meek), W. 3, 4, A. E.  
*Lumbriconerites austini* Foerste, E. 3.  
*Lyrodesma major* (Ulrich), W. 9.  
*Mastigograptus cf. gracillimus* (Lesquereux), W. 13.  
*Megalograptus welchi* Miller, W. 17.  
*Mesotrypa orbiculata* Cumings and Galloway, A. 3.  
*Mesotrypa patella* (Ulrich), Wh. 1-6.  
*Microceras inornatum* Hall, A-E.  
*Modiolodon subovalis* Ulrich, W. 3.  
*Modiolopsis concentrica* Hall and Whitfield, W. 3-5, 9.  
*Modiolopsis cfr. modiolaris* (Conrad), W. 4.  
*Monticulipora clevelandi* James, Wh. 4.  
*Monticulipora epidermata?* Ulrich and Bassler, E, 2.  
*Monticulipora parasitica* Ulrich, Wh. 1, 2.  
*Nereidavus varians* Grinnell, A-E.  
*Nicholsonella peculiaris* Cumings and Galloway, W.  
*Odontopleura onealli* (Miller), W.  
*Oenonites decipiens* Foerste, E. 3.  
*Opisthoptera casei* (Meek and Worthen), Wh. 5, E. 2.  
*Opisthoptera concordensis* Foerste, W. 9.  
*Opisthoptera fissicosta* (Meek), W. 3, 5.

- Opisthoptera obliqua* Ulrich, W. 9.  
*Orthoceras clarksvillensis* Foerste, W. 17.  
*Orthoceras duseri* Hall and Whitfield, W. 3.  
*Orthoceras fosteri* Miller, W. 4, 5.  
*Orthoceras mohri* Miller, A, 1, 3.  
*Orthodesma canaliculatum* Ulrich, A. 3.  
*Orthodesma curvatum* (Hall and Whitfield), W. 3, 5, 9.  
*Orthodesma rectum* (Hall and Whitfield), W. 3, 4, 9.  
*Orthodesma subangulatum* Ulrich, W. 9.  
*Pachydictya fenestelliformis* (Nicholson), Wh. 1, W. 2.  
*Paleschara beani* (James), W. 4, 9.  
*Peronopora decipiens* (Rominger), A-E.  
*Petraster speciosa* (Miller and Dyer), L. 3.  
*Phragmolites dyeri* (Hall), W, L. 2.  
*Platystrophia acutilirata* (Conrad), Wh. 1, 6.  
*Platystrophia acutilirata*, var. E. 1.  
*Platystrophia annieana* (James), W. 11.  
*Platystrophia clarksvillensis* Foerste, W. 3, 5.  
*Platystrophia cypha versaillesensis* Foerste, W. 9.  
*Platystrophia laticosta* (James), W. 5.  
*Platystrophia moritura* Cumings, E. 2.  
*Platystrophia ponderosa* Foerste, A. 2.  
*Plectambonites rugosus clarksvillensis* Foerste, W. 5, L. 1, 2, Wh. 1, 2.  
*Plectorthis* (Austinella) *scovillei* (Miller), W. 15.  
*Primitia concinnatiensis* (Miller), A. 3, W.  
*Primitia lativia* Ulrich, Wh. 6.  
*Primitia milleri* Ulrich, W.  
*Proboscina auloporoides* Nicholson, W.  
*Proboscina frondosa* (Nicholson), A. 3.  
*Protarea richmondensis* Foerste, W-E.  
*Psiloconcha elliptica* Ulrich, W. 9.  
*Psiloconcha grandis* Ulrich, W. 9.  
*Psiloconcha subrecta* Ulrich, W. 9.  
*Pterinea corrugata* (James), W.  
*Pterinea demissa* (Conrad), A-E.  
*Ptilodictya magnifica* Miller, Wh. 1.  
*Ptilodictya nodosa* James, W. 15, L., Wh. 1, 2.  
*Ptilodictya plumaria* James, Wh. 2.  
*Rafinesquina alternata* (Emmons) var. A-E.  
*Rafinesquina alternata toxorhytis* (Meek), W. 2, 3  
*Reteocrinus magnificus* Miller, W. 17.  
*Reteocrinus nealli* (Hall), W. 11, 17.  
*Rhaphanocrinus sculptus* (Miller), W. 17.  
*Rhinidictya lata* (Ulrich), W. 5  
*Rhombotrypa quadrata* (Rominger), W-E.  
*Rhombotrypa subquadrata* (Ulrich), W. 3.  
*Rhopalonaria venosa* Ulrich, W. 3, 5, 6, A. 3.  
*Rhynchotrema capax* (Conrad), W-E.  
*Rhynchotrema dentatum* Hall, W. 14.  
*Rusophycus biloba* Vanuxum, A-E.  
*Salpingostoma richmondensis* Ulrich Wh.  
*Schizocrania filosa* Hall, A. 2.  
*Schizolopha moorei* (Ulrich), W. 3, 5, 8.  
*Sinuities cancellatus* (Hall), A-E.



- Sinuities morrowensis* (Miller), W. 4.  
*Sinuities subcompressus* (Ulrich), W. 4.  
*Spatiopora corticans* Nicholson, W. 4.  
*Spatiopora montifera* Ulrich, W. 4.  
*Spatiopora tuberculata* (Edwards and Haime), W. 4, 9.  
*Spirorbis cincinnatiensis* (Miller and Dyer), W. 4.  
*Stomatopora arachnoidea* (Hall), A-E.  
*Streptelasma dispanum* Foerste, W. 11.  
*Streptelasma divaricans* (Nicholson), Wh. 1, L. 2.  
*Streptelasma rusticum* Billings, W-E.  
*Stromatocerium huronense* (Billings), W. 4, L. Wh.  
*Stromatocerium montiferum* (Ulrich), Wh.  
*Strophomena neglecta* (James), W. 12.  
*Strophomena nutans* Meek, W. 12.  
*Strophomena planumbona* (Hall), W., Wh. 1, 5, L. 2.  
*Strophomena planumbona-elongata* (James), W. 5, 17, L. 2.  
*Strophomena planumbona gerontica* Foerste, W. 7.  
*Strophomena sulcata* (Verneuil), W. 5, L. 2, Wh. 1-5.  
*Strophomena vetusta* (James), Wh. 5.  
*Succoceras (Cameroceras) inequabile* (Miller), W. 4, Wh. 1.  
*Tetradella lunatifera* (Ulrich), W-E.  
*Tetradella quadrilirata* (Hall and Whitfield), L. 2.  
*Tetradella simplex* (Ulrich), W-E.  
*Tetradium approximatum* Ulrich, W-E.  
*Trematis millepunctata* Hall, A-E.  
*Ulrichia nodosa* (Ulrich), A-E.  
*Whiteavesia pholadiformis* (Hall), W. 3-5, 9, Wh. 1.  
*Whitella obliquata* Ulrich, W. 4, 13.  
*Whitella ohioensis* Ulrich, W. 9.  
*Whitella quadrangularis* (Whitfield), Wh. 1, 11.  
*Xenocrinus baeri* (Meek), Wh. 1.  
*Zygospira kentuckiensis* James, W. 9.  
*Zygospira modesta* (Hall), A-E.

#### TYPE LOCALITIES

Warren and Clinton Counties have furnished the type specimens of a number of Richmond species, some of them so rare and so restricted in vertical range that it was thought appropriate to record the following observations for the benefit of future collectors.

*Agelacrinus austini* (Foerste): The type of this species was collected from the surface of the thick cap rock of the *Drepanella richardsoni* bed of the Whitewater in Dutch Creek, near Oakland, Ohio. It is also present at the same horizon in Hales Branch, also near Oakland and in upper Cowans Creek near Villars Chapel, Clinton County, Ohio. It has never been noted at any other horizon.

*Brachiospongia tuberculata* (James): The type specimen was found by a farmer and presented to the late Dr. L. B. Welch, of Wilmington, Ohio. It was taken from strata exposed in a small stream which flows into Todds Fork just below the bridge on the Wilmington and Lebanon pike one mile west of Sligo, Clinton

County, Ohio. Since all the strata exposed in this short tributary belong to the upper part of the Liberty, the specimen was undoubtedly derived from that horizon. We know of no other specimen of the species having been found in this territory. This type is now in Wilmington College together with the rest of the Welch collection.

*Canistrocrinus richardsoni* (Wetherby): The type of this species was discovered by Mr. J. M. Richardson in the crinoid bed (W. 17) at the top of the Waynesville on Cowan's Creek, Clinton County, Ohio, from which were taken the numerous specimens of *Lichenocrinus affinis* which established the fact that *Lichenocrinus* is not a cystid but a true crinoid. Although Mr. Richardson found a considerable number of *C. richardsoni* at this locality with their bodies well preserved, very few good specimens have been found elsewhere. One peculiarity of this species was the unusual length of its large column. One may occasionally find continuous sections five to six feet long lying partly imbedded on the surface of a limestone layer; the length of the entire column must have been much greater than this. As far as we know, its range is restricted to this bed.

*Catazyga headi schuchertana* (Ulrich): This species comes in a foot or two below the top of the Clarksville in the lower *Hebertella insculpta* bed. It appears to have been gregarious in its habits, developing widely separated colonies with only an occasional individual between. There is such a populous colony exposed in Mill Run, a little tributary of Todd's Fork just north of Clarksville, Ohio, and another at Blanchester, Ohio, in a little stream that enters into Second Creek. At other localities where its horizon is exposed, it is only on rare occasions that a specimen is to be found. This species appears to be confined in the region to the very limited range named above, not being found at any other horizon in the Richmond.

*Compsocrinus miamiensis* (Miller): From Jonahs Run near Harveysburg, and from Roaring Run near Wellman, both localities in Warren County, Ohio, we have collected this species from the crinoid bed (W. 17) at the top of the Waynesville. Whether its range extends beyond this horizon we can not say, but we have no knowledge of its occurrence elsewhere.

*Dendrocrinus caduceus* (Hall): The type of this species was found in Longstreth Branch at Oregonia, Warren County, Ohio, apparently in the crinoid bed (W. 17) at the top of the Waynesville. We have no knowledge of its occurrence east of the Little Miami River, nor do we know the extent of its vertical range.

*Dendrocrinus casei* (Meek): This species also appears to have made its first entrance into the Richmond at the crinoid bed (W. 17) at the top of the Waynesville. At one locality near Clarksville, Ohio, it was collected from this bed, where it was associated with *Reteocrinus nealli* and *Megalograptus welchi*. The species extends

upward through the Liberty, where it is most frequently met with, and up to a height of ten feet or more in the Whitewater.

*Dermatostroma corrugatum* (Foerste): The type of this species was found in the Ischyrodonta bed (Wh. 5) of the Whitewater along Dutch Creek, Clinton County, Ohio. Like all the colonies of *D. glyptum* we have seen, this specimen had chosen as its host the shell of *Endoceras proteiforme*. Partial decay of the latter left the specimen free, and subsequent pressure had caused it to break into several rather large fragments, one of which Doctor Foerste chose as the type.

*Dermatostroma glyptum* (Foerste): The type of this species now in the National Museum was collected in the lower bed (Wh. 3) of the Oakland division in Dutch Creek, near Oakland, Clinton County, Ohio. The species is apparently rare and does not seem to extend higher than about 15 feet above the base of this division.

*Drepanella richardsoni* (Miller): The type of this interesting ostracod came from the beds of the same name (Wh. 6 of the Oakland division) along Dutch Creek, Clinton County, Ohio. Here its free and entire shells outnumber those of all other species of the class associated with it. In the region its entire vertical range does not exceed six feet, ending with the close of the Oakland.

*Glyptocrinus? fornshelli* (Miller): The type of this species was found by Frank Fornshell in the crinoid bed (W. 17) at the top of the Waynesville,  $2\frac{1}{2}$  miles below Clarksville, Ohio, in the middle one of three small streams which cross the Clarksville and Morrow pike and later along unite to form one of the tributaries of Todds Fork. These branches are locally known as Madden's Run.

*Lichenocrinus affinis* (Miller): On lower Cowan's Creek in Clinton County, Ohio, one-half mile above the crossing of the Wilmington and Clarksville pike and the stream, there is an extensive exposure along the left bank, near the base of which the upper *Hebertella insculpta* bed is exposed. During the summer of 1898 we found in this bed a lenticular mass of rock four or five feet in diameter and not more than one or two inches thick at the center, the thickest part. This sheet was made up largely of the shells of *Zygospira modesta*, a few bryozoans and many fragments of *Isotelus maximus*, the interspaces being filled with clay and all tightly bound together by crystallization. Attached to many of the bryozoans and to many of the fragments of *Isotelus* were the basis of *Lichenocrinus affinis*. Again arising from the center of many of these disks were slender crinoidal columns which extended out from the disk through the clay for a greater or less distance to the point where they had been broken off. With these were sections of other columns identical in size and structure with these which, when followed along away

from the point of fracture ended at last in the body and arms of a very small crinoid. In this bed there were many disks and many crinoid bodies from which the columns had been entirely broken off and swept away and a still greater number of sections of columns showing fractures at both ends. Yet through all this material there runs such a unity of form that after a careful examination of these disconnected parts one can not doubt that in life they were all parts in the structure of the little crinoid whose highly modified root and the disk of the *Lichenocrinus* were one and the same.

*Megalograptus welchi* (Miller): One-half mile west of Clarksville, Ohio, the Clarksville and Morrow Pike crosses Todd's Fork and a little farther on a small tributary of that stream flowing from the north, just before reaching this last crossing, the Fort Ancient pike leaves the Morrow road and follows up the east bank of the tributary to the general level  $\frac{1}{4}$  mile above. Near the top of this grade a little house stands on the west side of the pike and in the tributary, immediately at the rear of the house, the crinoid bed (W. 17) at the top of the Waynesville is well exposed. Here in 1874, Dr. L. B. Welch of Wilmington, Ohio, discovered a pocket containing many columns and bodies of *Reteocrinus nealli* along with a less number of *Dendrocrinus casei*. While exploring the pocket for these species he unexpectedly uncovered the specimen which has served as the type of this species. This specimen lay apparently entire in the bed but was badly broken up in the removal and only a few fragments saved. We have never collected this form and do not know the extent of its vertical range. The locality is given in such detail that future collectors may rediscover this unique fossil.

*Platystrophia annieana* (James): The type of James species was found in a small stream to the west of Blanchester, Ohio, and just beyond the corporation limits. As the exposures in this stream and in Second Creek into which it flows do not extend but a few feet above the level of the *P. annieana* bed (W. 11) of the Blanchester division. It is to be assumed that this specimen came from this horizon. We have collected this form in the little stream at Blanchester and also in Stony Hollow at Clarksville, Ohio from this horizon.

*Plectorthis (Austinella) scovillei* (Miller): The range of this species appears to be confined to one or two limestone layers which together do not have a thickness of more than five or six inches. This bed is about five feet below the base of the upper *Hebertella insculpta* bed and is at the same level at which *Rhynchotrema capax* reappears in the Richmond (W. 15 of the Blanchester division). We have never seen this species in any of the exposures of this bed in Clinton County but in the Blacksmith Hollow and in other

streams around Oregonia, Ohio, it is fairly common within the narrow limits of its range. Although detached brachial and pedicle valves are equally common, we have never collected a specimen with these valves found in their natural position.

*Ptilodictya nodosa* (James) : The type of this species was collected by the late Dr. L. B. Welch from a limestone layer at the mouth of Cowan Creek, Clinton County, Ohio. The strata at this point belongs to the Blanchester division and comes in at about the level of the coral bed (W. 15). This apparently marks its point of entrance into the Richmond of this region. Its range extends upward through the remainder of the Blanchester through the entire thickness of the Liberty and up 15 to 20 feet in the Whitewater. This is a rare form throughout its entire range.



# A REVISION OF THE BEETLES OF THE GENUS OEDIONYCHIS OCCURRING IN AMERICA NORTH OF MEXICO

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## HISTORY OF THE GENUS

The first description of a North American species of *Oedionychis* was by Fabricius and appeared under the name *Altica thoracia*.<sup>1</sup> The genus *Altica*, originally proposed by Geoffroy<sup>2</sup> "in place of the name *Mordella*," was later sunk by Fabricius,<sup>3</sup> who distributed the species in the genera *Chrysomela*, *Lema*, *Crioceris*, and *Galleruca*, and described under *Galleruca* six new North American species now referred to *Oedionychis*. Illiger<sup>4</sup> revived the genus *Altica*, and following the correction made by his countrymen, Hoffmann, Müller, and others, called it *Haltica*. He divided this group, which was previously characterized simply by its saltatorial habits, into nine "families." The first two groups, the Physapodes, described as having the claw joint of the posterior tarsus globosely inflated and the elytra confusedly punctate or smooth, and the Oediopes, described as having the posterior claw globosely inflated and the elytra striate-punctate, furnished the basis for Latreille's<sup>5</sup> description of the genus *Oedionychis*.

Not till 1860, when the English entomologist Clark<sup>6</sup> wrote his monograph of the Halticidae, was the group again given study. Clark unfortunately left his work unfinished, and his treatment of the genus *Oedionychis*, published later,<sup>7</sup> consists merely of a catalogue of species. In 1873 Crotch<sup>8</sup> presented a key to the North American species of *Oedionychis*, a number of which he described

<sup>1</sup> Fabricius, Syst. Ent., App. 1775, p. 821.

<sup>2</sup> Geoffroy, Histoire abrégée des Insectes, 1762, p. 244.

<sup>3</sup> Fabricius, Syst. Eleuth., vol. 1, 1801, pp. 495, 499.

<sup>4</sup> Illiger, Magazin für Insektenkunde, vol. 6, 1807, p. 81.

<sup>5</sup> Latreille, Cuvier's Règne Animal, ed. 2, vol. 5, 1829, p. 154.

<sup>6</sup> Clark, Catalogue of Halticidae in the Collection of the British Museum, 1860.

<sup>7</sup> Clark, Catalogue of Halticidae, Journ. Ent., vol. 2, 1865, p. 163.

<sup>8</sup> Crotch, Proc. Acad. Philadelphia, vol. 25, 1873, p. 61.

as new. He also described a closely allied genus which he named *Hamletia* in honor of Hamlet Clark, author of the Catalogue of Halticidae. In 1875 appeared Chapuis'<sup>9</sup> work on Chrysomelidae with a detailed description of the genus *Oedionychis* which Horn in his treatment of the North American species has translated nearly literally. Chapuis pointed out an additional character, the open coxal cavities, separating *Oedionychis* from other genera having the globular claw. Von Harold<sup>10</sup> attempted to define clearly the closely related genera *Oedionychis*, *Homophoeta*, *Aspicela*, and *Asphaera*. He distinguished them not only by the degree of inflation of the claw joint, but also by the length of the first joint of the posterior tarsus, which in *Oedionychis* is comparatively short. He later published an account of the vittate species of this group.<sup>11</sup> Meanwhile Jacoby<sup>12</sup> was working on the Central American species, as well as publishing new species from South America, Africa, and India. He followed von Harold's distinctions pretty closely, but in one of his last papers<sup>13</sup> maintained that, although von Harold's distinctions were in the main valid, there is in some instances a gradation in the length of the first joint corresponding to the variability in the inflation of the claw joint. Horn's<sup>14</sup> work on the Halticidae of boreal America is the fullest and last account of the North American species of the genus. He recognized 26 species occurring north of Mexico, of which 5 were described as new.

Since Horn's treatment of the *Halticini* little has been done with the North American species of *Oedionychis*. The present paper is an attempt to dispel some of the confusion in one group of the genus, namely, that consisting of *Oedionychis quercata*, *obsidiana*, and *limbalis*, to incorporate species described since Horn's paper, and to add new species and varieties. It seems certain that among such closely related and variable forms as the Chrysomelidae more attention will be paid in the future to the numerous geographic or sub-specific forms. I have described these at some length, although it has not seemed desirable to dignify all of them with names. The habitats and descriptions in this paper are based entirely on specimens examined by the writer, unless otherwise stated. The synonymy for the most part has been based on that of previous writers.

The central habitat of the genus appears to be tropical America, and the species in America north of Mexico are comparatively few. Only two species, *Oedionychis violascens* and *Oe. lugens*, are definitely known to occur on the Pacific coast. *Oedionychis longula*,

<sup>9</sup> Lacordaire's Genera de Col., vol. 11, 1875, p. 84.

<sup>10</sup> Von Harold, Coleopterologische Hefte, vol. 15, 1876, p. 91.

<sup>11</sup> Von Harold, Berliner Entomologische Zeitschrift, vol. 25, 1881, p. 119.

<sup>12</sup> Jacoby, Biol. Cent. Amer., Coleopt., vol. 6, p. 1, 1880-1892.

<sup>13</sup> Jacoby, Proc. Zool. Soc. London, 1905, p. 398.

<sup>14</sup> Horn, Trans. Amer. Ent. Soc., vol. 16, 1889, p. 183.

described by von Harold from "California," has not since been identified. Four species are known to occur in Canada.

Specimens have been examined from the United States National Museum, Philadelphia Academy of Natural Sciences, Museum of Comparative Zoology, Boston Society of Natural History, University of Kansas, British Museum, and Museum of Natural History at Paris. At the last-named museum, where M. P. Lesne and his associates courteously placed the collections at my disposal, I had opportunity during the summer of 1925 to examine the old Bosc collection, in which are several specimens considered by M. Lesne to be cotypes of species described by Fabricius. I wish to express my thanks to the curators of the collections mentioned for the opportunity to study the specimens in their charge, to Dr. A. G. Böving for his description and drawing of the larval stage, to Dr. F. H. Chittenden for his encouragement in this study, and to Dr. E. A. Schwarz and Mr. H. S. Barber for their constant assistance and advice.

#### DESCRIPTION OF THE GENUS

The main characters differentiating the genus *Oedionychis* from related genera are (1) the swollen, globular claw joint of the hind tarsus and the comparatively short first joint of the posterior tarsus; (2) the confusedly punctate or smooth and glabrous elytra; (3) the open coxal cavities; and (4) the wide prothorax, not much narrower than the elytra.

The genus is composed of species widely dissimilar in general appearance. The North American species range in length from 3 to 8 mm., and there are larger species in tropical America. In color they vary from pale, almost waxy, to lustrous metallic green, blue, or purple, and even opaque black; they may be concolorous, spotted, vittate, or transversely banded.

The head is usually exposed to the eyes. The prothorax is always considerably wider than long, has a more or less explanate margin, and has usually dentiform anterior angles. The scutellum is either small and triangular, or in the larger, more convex species, rounded. The elytra are sometimes very narrowly, sometimes widely explanate. At base the elytra are not much wider than the prothorax, but widen ovately in some species, and in others are broadly or narrowly oblong. The punctation when present is always confused, never striate; frequently the surface is nearly impunctate, never pubescent. The body beneath is usually lightly pubescent. The epipleura vary with the width of the explanate margins, the species with broad margins having wider epipleura reaching nearly to the apex. The legs are relatively short. The posterior legs have the femora much thickened, with a little tooth just above the tarsus on the tibiae,



and a spur at the end. The claw joint of the tarsus is inflated and round with the claws appendiculate.

#### LARVAE AND EGGS

The only record of the larvae of this genus is that of E. M. Craighead, who observed the larvæ of *Oedionychis gibbitarsa* feeding on the leaves of an unknown mint.<sup>15</sup> Mr. Craighead kindly sent me his preserved specimens which Dr. A. G. Böving has described in a separate publication, extracts of which are given below. Miss M. E. Murtfeldt collected the pupa of this species at Baltimore many years ago. She found the insect pupating in the ground in a little earthen cell. H. O. Marsh collected eggs of *Oedionychis interjectionis* on "tallow weed" (*Euphorbia antisiphilitica*?) in Texas. They are elongate oblong, yellowish-white, and about 1 mm. in length. Eggs of *Oe. circumdata* have been obtained by the writer in the District of Columbia on *Verbena urticaefolia*. They are deep orange, clavate, a little over 1 mm. in length, and are laid singly.

#### MATURE LARVA

(Described by Dr. A. G. Böving from specimens preserved in the United States National Museum, marked: "*Oedionychis gibbitarsa* Say on mint, Chambersburg, Pa., 20 July 1921. E. M. Craighead Coll.")

Length: About 10 mm.

General form and color: Head strongly hypognathous with frons vertical to the length of the body-trunk and seen from above almost hidden below prothorax. Head capsule yellowish-brown with blackish-brown margins and blackish-brown frontal carina; labrum, mandibles, and chitinous parts of antennæ and ventral mouthparts yellowish brown, most of the head-setae long, pointed, and brownish. Body subcylindrical, slightly flattened dorsally and ventrally, somewhat tapering forward from metathorax and backward from sixth abdominal segment to posterior part of eighth abdominal segment, ninth and tenth small, together forming a walking apparatus; all segments fleshy cream-whitish, with numerous soft protuberances carrying straw-yellow setal cups and setae, no prothoracic shield and no shield dorsally on ninth abdominal segment. Legs strong, of medium size and inserted widely apart to the end of small, inverted T-shaped hypopleural chitinizations; their color light straw-yellow with narrow darkenings at the articulations; behind the falciform claw with a membranous empodium shorter than the claw. Spiracles annular, pale straw-yellow, of middle size, all alike and lateral; one in the mesothoracic epipleurum and one immediately in front of the epipleural lobes of the first eight abdominal segments.

In common with most of the Halticinae larvae are the following structural details of the head and mouthparts: Antennae two-jointed with basal membrane large, enabling a complete retraction of the whole antenna; proximal antennal joint rather low and ringshaped with its top-membrane carrying

<sup>15</sup> E. M. Craighead, Ent. News, vol. 34, 1923, p. 119.

several small sensory papillae and sensory pits, distal antennal joint minute, bicuspidate and practically replaced by the large conical tactile supplementary joint; mandible palmate with several distal teeth and a group of many long setae medianly on inner margin; maxillary mala (or "lobe") large, anteriorly rounded, proximally carrying a longitudinal series of setae along inner margin, distally several setae irregularly distributed and a two-jointed peg, probably with sensory function; gula absent; submentum and mentum fused into a large sub-trapezoidal region; labium small, short and covered with a handlike chitization, constricted in the middle, labial palpus present, ligula indistinct and very broad.

The characters which particularly determine the generic position of the present larva are the following: Epicranial halves with hind-corners triangular, short and obtuse, the frons reaching to the occipital foramen, thus no epicranial suture present; ocellus lacking; labrum antero-medially with crescent-shaped, light, membranous region, antero-laterally along margin with numerous small, straight setulae (in an undetermined species from Haiti: with small, hookshaped setulae); number of terminal teeth of mandible five and mandibular setae on inner margin arranged in a long series; labial palpus two-jointed. Prothoracic tergum with conical protuberances arranged in a flat ring along the margin; terga of mesothorax, metathorax, and the first eight abdominal segments with conical protuberances arranged in an anterior row of two belonging to the prescutal area, a posterior row of four belonging to the scuto-scutellar area and in each alar area a large rounded protuberance carrying from two to four setae (in the undetermined species from Haiti with only one or two; ninth abdominal segment posteriorly scalloped and seta-bearing; tenth abdominal segment soft, ventral, developed as a typical pseudopod with the anal opening situated terminally between the lips of the sucking disk. [A. G. Böving.]



FIG. 1.—LARVA OF OEDIONYCHIS GIBBITARSA SAY  $\times 7$

#### FOOD HABITS

Very little is known of the habits of this genus. The adult beetles appear to feed chiefly on the foliage of shrubs and trees. Only one is known to approach economic importance, *Oe. sexmaculata*, which has been found in injurious numbers on ash (*Fraxinus* species). *Oe. quercata* was so named because it was found on oak. *Oe. obsidiana* has been found by W. A. Hoffman feeding on winterberry (*Ilex verticillata*) and strawberry bush (*Euonymus americanus*), and I have observed *Oe. circumdata* feeding in spring on the tender leaves of beech (*Fagus grandifolia*). Blatchley gives the Ericaceae as the food plants of several species in Florida.

#### KEY TO THE SPECIES

Usually large (4—8 mm.), convex, margins usually very narrow or lacking; antennae moderately stout, usually not half the length of body, front vertical, eyes rather widely set, interocular space at least half width of head, interocular depression tending to be indistinct-----Series A.

Usually small (3—6 mm.), depressed, margins explanate, usually moderately wide; antennae slender, at least half the length of the body, front oblique, eyes often large and usually closely set, interocular space rarely over half width of head, interocular depression distinct.-----Series B.

# SERIES A

1. Pronotum dark without trace of yellow or reddish brown, head always dark ----- 2.  
Pronotum yellow or reddish brown, sometimes spotted or fasciate, head dark or pale.----- 4.
2. Head, pronotum, and elytra entirely blue or purple, elytra coarsely punctate.----- (1) *violascens*.  
Head, pronotum, and elytra black, sometimes with bluish, greenish, or purplish luster, elytra very faintly punctate, nearly smooth----- 3.
3. Head with front flat, tubercles indistinct, no trace of reddish brown frontal spots, third and fourth antennal joints about equal. Arizona, Rocky Mountains, British Columbia, Hudson's Bay----- (2) *lugens*.  
Head with front not flat, tubercles distinct, usually with indistinct reddish-brown spot on either side of front, third antennal joint a little longer than fourth. Georgia, Texas, Illinois----- (3) *conclinna*.
4. Head dark, usually with pale front or pale frontal spot----- 5.  
Head yellowish to reddish brown, sometimes with large dark spot covering vertex and front, leaving only margins about eyes pale----- 10.
5. Pronotum with a fascia or spots, these sometimes confluent----- 6.  
Pronotum immaculate, pale yellow----- 9.
6. Head nearly black, sometimes with indistinct reddish brown frontal spot; pronotum dull yellow with five piceous spots, these frequently united in an irregular triangular blotch or fascia; elytra entirely yellow brown or with a broad, piceous, median vitta on each elytron----- (10) *imbriata*.  
Head piceous, usually with reddish or yellowish frontal spot----- 7.
7. Pronotum pale yellow with five black spots, sometimes united to form fascia; elytra yellow with common black sutural vitta and on each elytron a median vitta and narrow submarginal vitta, the last reaching from middle nearly to apex; body beneath black, margin and last ventral segment yellow----- (8) *aemula*.  
Pronotum reddish or dull yellow, with five piceous spots sometimes confluent, or with a wide band----- 8.
8. Elytra varying from deep brown to piceous or black with bluish or greenish luster, feebly shining, finely punctate, pronotum over twice as wide as long, finely punctate; abdomen with yellow margin----- (4) *vians*.  
Elytra opaque bluish black, almost smooth, pronotum twice as wide as long, coarsely punctate; abdomen entirely yellow or with only faint trace of yellow brown in middle----- (5) *discicollis*.
9. Elytra green or black with yellowish white vittae (occasionally elytra entirely green), margin usually pale, and yellowish white vitta on each elytron often broken near apex, producing an ! mark on each elytron.----- (6) *interjectionis*.  
Elytra brown with five large pale yellow blotches on either elytron.----- (7) *jacobiana*.
10. Elytra not vittate----- 11.  
Elytra vittate----- 15.
11. Rounded oblong-oval, brilliantly lustrous----- 12.  
Oblong-oval, feebly shining----- 14.

12. Elytra entirely dark shining blue, purple, or green without trace of yellow. (11) *gibbitarsa*.  
 Elytra dark with yellow margin-----13.
13. Head deeply punctate except on occiput, pronotum often with only one median piceous spot, sometimes three spots, elytra blue, purple, or green with distinct narrow yellow margin----- (12) *flavocyanea*.  
 Head rather sparsely punctate about eyes, pronotum indistinctly marked with from three to five pale reddish spots, elytra dark blue with yellow margin wider at apex and forming a scalloped pattern--- (13) *lateralis*.
14. Head yellow, sometimes with dark spot on occiput; pronotum usually seven-spotted, spots frequently united to form a zigzag fascia; elytra dull blue, green, or purplish with narrow yellow margin along upper half. (9) *thoracica*.  
 Head varying from pale reddish brown to nearly black, sometimes with darker interocular band and dark band on posterior part of occiput. pronotum with five piceous spots, frequently united to form triangular blotch or fascia; elytra entirely yellowish brown or with a broad, piceous, median vitta on each elytron, nearly covering it--- (10) *ambriata*.
15. Elytra with two vittae (a broad, piceous, median vitta on each elytron). (10) *ambriata*.  
 Elytra with more than two vittae----- 16.
16. Elytra with five vittae----- 17.  
 Elytra with three vittae----- 18.
17. Yellow brown, pronotum with narrow explanate margin and with piceous median spot or band; elytra with moderately broad, piceous, common sutural vitta occasionally with greenish or purplish luster, and on each elytron a median and submarginal vitta. Middle and Eastern United States----- (15) *petaurista*.  
 Yellow brown, pronotum with moderately broad explanate margin and indistinct dark spots; elytra with narrow vittae, frequently having purplish or greenish luster, a common sutural vitta and a median and submarginal vitta on each elytron. *Arizona*----- (14) *tenuilineata*.
18. Elytra with common sutural vitta and narrow submarginal vitta on each elytron; pronotum with reddish or piceous median blotch--- (15) *petaurista*.  
 Elytra with common sutural vitta and median vitta on each elytron--- 19.
19. Head finely punctate with occiput and front dark, leaving only margin about eyes yellow, pronotum two-spotted or with spots confluent, elytra pale yellow with wide sutural and wide median-lateral vitta leaving only margin pale, very finely punctate and shining----- (16) *amplivittata*.  
 Head usually coarsely punctate, reddish brown----- 20.
20. Third antennal joint shorter than fourth. Eastern and Middle States. (17) *miniata*.  
 Third and fourth antennal joints about equal, head somewhat smoother on occiput. Florida----- (18) *ulkei*.

## SERIES B

1. Elytra with only slight trace of humeral prominences and callosities at scutellar angle, and little trace of depression between. Explanate margins narrow-----2.  
 Elytra usually with distinct callosity near base of each elytron at scutellar angle, and marked humeral prominences. Margins usually moderately to widely explanate-----6.

2. Elytra dark blue with no trace of yellow----- (19) *indigoptera*.  
Elytra yellow with or without markings-----3.
3. Elytra entirely yellow. Oblong, shining, almost impunctate, darker reddish yellow beneath----- (22) *flavida*.  
Elytra yellow with dark markings-----4.
4. Elytra with dark spots. Pale yellow, shining, nearly smooth, each elytron usually with five or six piceous spots----- (29) *nigrosignata*.  
Elytra not spotted-----5.
5. Elytra oval with large piceous sutural area of variable size, leaving margins and apex more or less broadly yellow----- (20) *thyamoides*.  
Elytra narrowly oval with entire piceous sutural vitta reaching apex, frequently a median vitta in each elytron, often disappearing in part or united with sutural vitta----- (21) *texana*.
6. Broadly oval, sides of elytra arcuate-----7.  
More elongate, sides of elytra essentially parallel-----10.
7. Elytra margin very narrow, not reflexed; punctation on elytra very light; yellow brown, elytra piceous with very narrow pale yellow-brown margin and pale apex----- (23) *saltatra*.  
Elytral margin broad, often slightly reflexed; punctation on elytra moderately coarse-----8.
8. Elytra entirely black or sometimes with dark ferruginous margin, head and pronotum reddish brown, never with dark occipital spot.  
(24) *quercata*.  
Elytra always with yellow-brown margin, head and pronotum yellow brown, frequently with dark occipital spot-----9.
9. Yellow brown with distinct broad piceous lateral vitta and short vitta in middle at base of each elytron----- (25) *pervittata*.  
Yellow brown with light brown to piceous elytra, margins always pale.  
(26) *subvittata* var.  
Yellow brown with indistinct vittate markings on elytra varying from pale brown to nearly piceous----- (26) *subvittata*.
10. Head coarsely punctate----- 11.  
Head faintly punctate, nearly smooth----- 12.
11. Head, pronotum, and elytra coarsely and deeply punctate; yellow brown with dark blotches on pronotum and upper half of elytra, and broad, zigzag fascia across lower half of elytra; lateral fold from intrahumeral depression extending nearly to apex, parallel to margin.  
(27) *sexmaculata*.  
Head and elytra not so coarsely punctate, pronotum smooth; pale yellow with reddish head and reddish sutural vitta extending three-fourths the length of the elytra, spreading across base of elytra to cover humeri, frequently a spot in middle and at apex of each elytron, sometimes uniting with sutural vitta to form fascia; no lateral fold----- (28) *suturalis*.
12. Elytra narrowly oblong-oval, humeral prominences small, no marked callosity at scutellar angle----- 13.  
Elytra oblong-oval, humeral prominences distinct, a well-marked sulcus within and a more or less well-marked callosity at scutellar angle----- 14.
13. Shining, smooth, pale yellow, with no dark markings on head; each elytron with five or six spots, no sutural vitta, no basal margin across elytra.  
(29) *nigrosignata*.  
Feebly shining, elytra distinctly punctate, pale yellow, head with piceous spot, sutural vitta not entire, each elytron with five or six spots and a narrow margin across base----- (30) *spilonota*.

14. Elytra with parallel sides and with distinct humeral prominences, but somewhat flattened disk, eyes small, interocular space at least half width of head, elytra piceous with yellow-brown margin, broader at apex. (81) *circumdata*.  
Elytra with distinct humeral prominences and with rounded callosity at base of each elytron near scutellar angle, eyes large, interocular space approaching one-third width of head----- 15.
15. Small, 3—4 mm----- 16.  
Large, 4—5 mm----- 17.
16. Shining, very finely punctate, entirely piceous with pale margins and apex----- (82) *obsidiana*.  
Shining, very finely punctate, pronotum yellow often with dark blotches, elytra yellow with piceous fasciae or remnants of fasciae at base, middle, and near apex----- (32) *obsidiana* var. *flava*.
17. Feebly shining, rather coarsely punctate, yellow brown with reddish brown or piceous spot on head, pronotum usually immaculate or with faint, indeterminate shadings, elytra usually with reddish brown or piceous fasciae or remnants of fasciae at base, middle, and apex, apical one never at less than apical three-fourths. Eastern United States--- (33) *scalaris*.  
Feebly shining, finely punctate, yellow brown, head and pronotum immaculate, elytra with ten to twelve small piceous spots, two or four basal spots, four nearly transverse at basal fourth, four not in transverse line, lowest at apical two-thirds. Arizona----- (34) *durangoensis*.

## DESCRIPTIONS OF SPECIES

### 1. OEDIONYCHIS VIOLASCENS LeConte

Fig. 1.

*Oedionychis violascens* LeConte, Proc. Acad. Philadelphia, vol. 11, 1859, p. 81.—  
CROCH, Proc. Acad. Philadelphia, vol. 25, 1873, p. 61.—HORN, Trans. Amer.  
Ent. Soc., vol. 16, 1889, p. 183.

Broadly oblong-oval, moderately convex, shining blue or violet. Antennae not half length of body, submoniliform, black or bluish black with terminal joints piceous, third and fourth joints about equal. Head shining dark blue with antennal sockets pale brown, coarsely punctate about and between eyes, occiput sometimes nearly smooth; front not flat as in *lugens* and no median groove, interocular space over half width of head. Pronotum over twice as wide as long, moderately convex, narrowed anteriorly and with narrow, slightly reflexed, explanate margin, very shining, faintly yet distinctly and sparsely punctate, punctures much denser posteriorly. Scutellum rounded, shining. Elytra oblong-oval, moderately convex, broadly rounded at apex, with narrow margin; humeri moderately prominent, only faint trace of depression within; punctuation variable, frequently deep and coarse, smoother toward apex; color entirely blue or violet. Body beneath sparsely pubescent, shining, blue or violet, the tarsi piceous.

*Length*.—5 to 6 mm.; width 2.5 to 3.5 mm.

*Type locality*.—Fort Tejon, Calif.

*Distribution*.—California, Nevada.

This species differs from *Oe. lugens* var. *lamprocyanea* in its more broadly oval shape, its wide, rounded apex, its shining pronotum, and very shining, coarsely punctate elytra. There is no trace of yellow on abdomen.

Jacoby's *Oe. semipurpurea* (described from a single Mexican specimen) is very shining, with pronotum sparsely and yet distinctly punctate and elytra more coarsely and densely punctate, and body beneath entirely dark. It is very closely allied to *Oe. violascens*, and perhaps identical.

## 2. OEDIONYCHIS LUGENS LeConte

Fig. 2

*Oedionychis lugens* LeConte, Col. Kans., 1859, p. 24.—Crotch, Proc. Acad. Philadelphia, vol. 25, 1873, p. 61.—Horn, Trans. Amer. Ent. Soc., vol. 16, 1889, p. 183.

Oblong-oval, somewhat convex, varying from dull, lusterless black to black with distinct bluish, purplish, or aeneous luster. Antennae not half the length of body, submoniliform, black, third and fourth joints about equal. Head dull black with antennal sockets pale brown, flat in front with tubercles very indistinct, coarsely punctate about eyes, occiput and front usually more or less smooth, median groove faint and indistinct, interocular space over half width of head. Pronotum over twice as wide as long, arcuately narrowed anteriorly, somewhat convex but not so much as in *concinna*, with very narrow, explanate margin wider anteriorly; finely and sparsely punctate, punctures or lack of punctures on slight elevations forming an indistinct pattern in middle of pronotum. Scutellum rounded, black, shining. Elytra oblong, sides nearly parallel, umbone prominences not marked, basal sulcus within well marked; margin very narrow, punctation very faint and fine, nearly invisible, showing chiefly as tiny lines produced by minute confluent punctures; color entirely black, often opaque, sometimes with bluish, purplish, or aeneous luster. Body beneath finely pubescent, black, sometimes with slight bluish luster, sometimes tip of last abdominal segment, occasionally margin of other segments, yellowish, abdomen dorsally yellow; tarsi slightly reddish piceous, epipleura dark.

*Length*.—4.5 to 6 mm.; width 2.5 to 3 mm.

*Type locality*.—Santa Fe, N. Mex.

*Distribution*.—California, Arizona, New Mexico, Colorado, Montana, British America, Alberta, Arctic region, Hudson Bay.

This species was described by LeConte as dull, opaque black, with tip of abdominal segment and back pale yellow. The type came from Santa Fe, N. Mex. Horn adds Arizona as its habitat. A series of specimens in the National Museum from Arizona is dull, opaque black, some with no yellow on abdominal segments, some with tip of abdomen yellow. Another series from Montana and Colorado is not opaque black, but dull piceous, feebly shining, three specimens having abdomen without yellow, one with entire last abdominal segment and margin of next broadly yellow. In the Casey collection are four specimens from California, from just over the Nevada boundary, at an altitude of 5,800 feet, which are polished and even lustrous aeneous, and in only one is there any sign of yellow tip to abdomen. A third series from British America is dull blue black, feebly shining, with tip of abdomen yellow. In the British Museum is a fourth series of specimens labeled by Baly *Oedionychis arctica* (manuscript name) with the locality labels Arctic America and Hudson Bay. They are dull black with a faint bronze or purple luster, and in two of the seven specimens there is a yellow tip to abdomen. Jacoby has mentioned this name and stated that he was unable to separate the specimens so labeled from his Mexican *modesta*. He described *Oe. modesta* as having no pale abdominal segments.<sup>16</sup> In the fourteen specimens of *modesta* in the British Museum one has a faint yellow-brown margin to abdomen and several a yellow point at apex, which is as much yellow on the abdomen as in many specimens of *lugens* of the Rocky Mountains and Canada. The specimens of *Oe. modesta* are distinctly smaller, from 4 to 5 mm. in length, and are variable in metallic luster, but otherwise I can find no differences. The range of *Oe. lugens*, if these are all of that species, would be from southern Mexico to Hudson Bay, an exceedingly long range, explainable only by the theory that this is an upper Sonoran or almost boreal species inhabiting high altitudes in Mexico and the Rocky Mountains.

In the National Museum is a series from Arizona so distinct in appearance from the typical opaque black *lugens* of Arizona that it seems worthy of varietal distinction.

**OEDIONYCHIS LUGENS LAMPROCYANEA, new variety**

Moderately shining dark blue or bluish green. Head densely and coarsely punctate usually throughout, pronotum densely and moderately coarsely punctate, elytra finely punctate, more distinctly so at base. Beneath, the last ventral segment entirely yellow brown and margins of other segments more or less yellow brown.

*Length.*—5 to 6.3 mm.

<sup>16</sup> Biol. Cent. Amer., Coleopt., vol. 6, pt. 1, 1886, p. 411.



*Type and 6 paratypes*.—Cat. No. 29154, U.S.N.M. 14 paratypes from Baboquivari Mountains and Santa Rita Mountains, Ariz., in Kansas University Collection.

*Type locality*.—Santa Rita Mountains, Ariz.

*Distribution*.—Arizona (Santa Rita Mountains; Oracle; Baboquivari Mountains), Colorado (Boulder).

### 3. OEDIONYCHIS CONCINNA (Fabricius)

Fig. 3

*Galleruca concinna* FABRICIUS, Syst. Eleuth., vol. 1, 1801, p. 499.

*Altica concinna* OLIVIER, Ent., vol. 6, 1808, p. 679.

*Oedionychis vians* var. *concinna* CROTCH, Proc. Acad. Philadelphia, vol. 25, 1873, p. 61.

*Oedionychis concinna* HORN, Trans. Amer. Ent. Soc., vol. 16, 1889, p. 182.

Elongate oblong-oval, moderately convex, dull piceous or black, often feebly shining with purple or green luster, last abdominal segments more or less yellow brown. Antennae not half the length of body, stout, piceous, third joint usually a little longer than fourth. Head piceous, usually having two indistinct reddish brown spots on either side of front, usually coarsely and deeply punctate about eyes, front and occiput smooth, median depression distinct, interocular space about half width of head. Pronotum twice as wide as long, convex, with very narrow explanate margin, narrowed straightly anteriorly; distinctly but sparsely punctate. Scutellum rounded, shining, black. Elytra elongate-oval, moderately convex with very narrow margin and with rounded umbone prominences producing deep basal sulcus, finely and faintly punctate, sometimes appearing nearly smooth except about base and along suture; entirely dark colored with purplish or greenish luster or piceous. Body beneath finely and sparsely pubescent, shining, piceous or black, with abdomen more or less yellow brown, epipleura dark.

*Length*.—5.5 to 7 mm.; width 2.5 to 3.5 mm.

*Type locality*.—Carolina.

*Distribution*.—Carolina, Georgia, Florida, Louisiana, Mississippi, Texas, Illinois.

This species is not easily distinguishable in all cases from *lugens*. In general it is more convex and with longer elytra, and the ventral surface has more yellow brown on abdomen. There are more distinct prominences and a deeper median depression on front of head, and on the front of the head are two indistinct reddish brown spots. The usual distribution appears to be southern, but in the Museum of Comparative Zoology are two specimens labeled Illinois, and W. S. Blatchley gives Lake County, Ind., as a locality.

## 4. OEDIONYCHIS VIANs (Illiger)

Figs. 4 and 5

*Haltica vians* ILLIGER, Mag. f. Insektenkunde, vol. 6, 1807, p. 83.*Altica abdominalis* OLIVIER, Ent., vol. 6, 1808, p. 679.*Altica scripticollis* SAY, Journ. Acad. Philadelphia, 1824, p. 84.*Oedionychis scripticollis* LeCONTE, Proc. Acad. Philadelphia, vol. 12, 1860, p. 321.*Oedionychis thoracica*, var. CLARK, Journ. Ent., vol. 2, 1866, p. 166.*Oedionychis vians* var. *scripticollis* CROUCH, Proc. Acad. Philadelphia, vol. 25, 1873, p. 61.*Oedionychis vians* HORN, Trans. Amer. Ent. Soc., vol. 16, 1889, p. 182.

Elongate oval, somewhat convex, dull purplish or greenish black, the pronotum red, fading to yellow, with a broad dark fascia or confluent spots suggesting letter M in shape. Antennae not half length of body, moderately stout, reddish brown or piceous, third joint usually a little longer than fourth. Head piceous, usually with a reddish brown front, sparsely and deeply punctate about and between eyes, occiput smooth, median depression short and distinct, interocular space over half width of head. Pronotum over twice as wide as long, narrowed anteriorly; explanate margin narrow, with nearly straight sides, finely punctate; a wide piceous or greenish black fascia extending in some instances almost across pronotum and leaving margins red (in fresh specimens), fading to yellow; fascia sometimes irregular, suggesting in outline the letter M. Scutellum rounded, shining black. Elytra oblong-oval, moderately convex, with narrow margin, humeri rounded with a basal sulcus within; punctation varying from coarse to fine and shallow, sometimes nearly obsolete, surface always alutaceous, entirely dull purplish or greenish black. Body beneath shining, rather sparsely pubescent, sometimes almost entirely piceous except for yellow prosternum and last ventral segment, usually abdomen only partially reddish brown or piceous, with wide yellow margin; legs dark brown or piceous; epipleura piceous.

*Length*.—4 to 6.5 mm.; width 2.2 to 3.5 mm.

*Type locality*.—Pennsylvania.

*Distribution*.—New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, Pennsylvania, New Jersey, Maryland, District of Columbia, Virginia, North Carolina, Florida, Kentucky, Tennessee, Alabama, Louisiana, Texas, Kansas, Nebraska, Iowa, Illinois, Michigan, Colorado, and Alberta.

Illiger originally described this species from Pennsylvania. Say distinguished another species, '*Oe. scripticollis*', as closely allied to *vians*, but differing by its "frontal spot and undulated litterate form of thoracic spot," and gave its locality as Missouri. Crotch

later placed *scripticollis* as a variety of *vians*, and gave its locality as Hudson Bay and Slave Lake. Say's distinction of *vians* and *scripticollis* on the basis of the frontal spot does not hold, as this spot is common to both. The sinuate thoracic markings appear to accompany a deeper and coarser punctation, and such specimens are duller. It also seems to be a more northern and western form, occurring in Colorado, Kansas, Missouri, Alberta, Michigan, and New York, although one specimen is labeled from as far south as Fort Monroe, Va. The southern specimens of *vians* have lighter punctation, in some cases are almost smooth, and are more shining. A series from Florida has the punctures obsolete and is brightly shining with metallic luster. The thoracic band in these is widened to cover nearly all of the pronotum with scarcely any visible lighter anterior margin.

W. S. Blatchley reports finding *Oe. vians* in Florida on oak, and R. A. Cushman bred it from the "stem of *Polygonum pennsylvanicum*."

There are two other specimens in the National Museum that I have placed with doubt as the following variety of *vians*:

**OEDIONYCHIS VIANIS BADIA, new variety**

Head and prothorax similar to those of *vians*. Elytra deep reddish brown and coarsely punctate, punctation coarser and shallower than the punctate form of *vians* and resembling the punctation of *Oe. fimbriata*. Elytra not dull as in punctate form of *vians*, but moderately shining; surface not alutaceous. Elytra shorter than in typical *vians* and markedly more rounded at apex. Beneath, epipleura and abdomen pale, the latter with deep brown area in middle.

*Length*.—5 to 5.2 mm.; width, 3 mm.

*Type and paratype*.—Cat. No. 29155, U.S.N.M.

*Type locality*.—Fort Monroe, Va. (E. A. Schwarz).

The specimens were originally placed in the collection with *Oe. fimbriata*, but they differ from that species in shape of prothorax and elytra as well as in markings.

**5. OEDIONYCHIS DISCICOLLIS (Crotch)**

Fig. 6

*Oedionychis discicollis* DEJEAN, Catalogue, ed. 3, 1837, p. 410 (nomen nudum).  
*Oedionychis vians* var. *discicollis* CROTCH, Proc. Acad. Philadelphia, vol. 25, 1873, p. 61.

Oblong-oval, opaque, head dark with pale frontal spot, prothorax heavily punctate, reddish or yellowish brown with broad, dark fascia, elytra entirely bluish black, almost smooth. Antennae not half length of body, stout, third joint longer than fourth. Head

dark, sometimes with lighter reddish brown frontal spot, coarsely punctate, interocular space more than half width of head, no marked frontal prominences. Pronotum twice as wide as long, narrowed somewhat anteriorly, with straight sides and narrow explanate margin, not shining, coarsely punctate; a broad, dull bluish-black fascia extending over pronotum, leaving only narrow reddish or yellowish margin. Scutellum rounded, dark. Elytra elongate oblong, with very narrow explanate margin, slightly convex; entirely dull bluish black, almost smooth, with fine, sparse punctures. Body beneath yellowish brown with dark brown legs, occasionally darker brown spot in middle of abdomen, epipleura dark.

*Length*.—6.8 to 8 mm.; width, 3.4 to 4 mm.

*Type locality*.—Southern States.

*Distribution*.—Florida.

The old DeJean catalogue specimen in the British Museum labeled *Oe. discicollis* has simply the locality "Amer. bor." Crotch described this species as a variety of *vians*, from the "Southern States," and gave its characters as "very opaque, the elytral punctuation obsolete, thoracic punctuation very deep and coarse." It differs very markedly from both *vians* and *thoracica* in the length of the prothorax. In *vians* and *thoracica* the prothorax is not nearly half as long as wide, whereas in *discicollis* the length of the prothorax approaches half its width, and the shape is more rectangular. The species is also slightly larger than *vians*.

The name *discicollis* was used by Clark in his catalogue for a South American species and later was adopted by Jacoby in a description of that species.<sup>17</sup> Crotch's earlier varietal name preoccupies the name *discicollis* used by Jacoby.

#### 6. OEDIONYCHIS INTERJECTIONIS Crotch

Fig. 12

*Oedionychis interjectionis* CROTCH, Proc. Acad. Philadelphia, vol. 25, 1873 p. 61.—

HOEN, Trans. Amer. Ent. Soc., vol. 16, 1889, p. 184.

*Oedionychis gracilis* JACOBY, Biol. Cent. Amer., Coleopt., vol. 6, pt. 1, 1886, p. 420.

Elongate oblong, moderately convex, shining, pale yellow, a dark green, brown, or black sutural vitta and lateral vitta on each elytron, these vittae occasionally uniting below middle and at apex. Antennae not half length of body, moderately stout, dark brown, basal joints and terminal joint sometimes paler, third joint a little longer than fourth. Head with flat, yellow front, otherwise shining dark green or black; a row of punctures about yellow front and eyes, otherwise smooth; eyes large, interocular space half width of head,

<sup>17</sup> Proc. Zool. Soc. London, 1894, p. 611.

median groove short and distinct. Pronotum twice as wide as long, almost rectangular, with narrow explanate margin, pale yellow, sometimes waxy, shining and nearly impunctate. Scutellum rounded, black, shining. Elytra oblong, moderately convex, with rounded humeral prominences and faint trace of sulcus within, and very narrow margin, shining, very faintly punctate; a dark green, brown, or black sutural vitta and a lateral vitta widening below middle and occasionally uniting with sutural vitta below middle and about apex, thus forming with the enclosed light yellow or whitish areas a semblance to an exclamation mark on each elytron; margin usually pale. Body beneath finely pubescent, abdomen yellowish brown, meso and metasterna and anterior legs usually dark brown; epipleura dark brown or black.

*Length*.—5 to 6 mm.; width 2 to 3 mm.

*Type locality*.—Texas.

*Distribution*.—Texas, Louisiana.

Jacoby described this among the Central American species of *Oedionychis* as *gracilis*. Horn called *gracilis* merely a variety of *interjectionis* having the subsutural white vitta entire.

There is also a form of this species with elytra entirely green. One specimen in the National Museum is nearly green except for a short, white vitta in basal half of either elytron.

H. O. Marsh found the eggs and adult beetles on "tallow weed" (*Euphorbia antisiphilitica*?) at Brownsville, Tex.

#### 7. OEDIONYCHIS JACOBIANA Horn

*Oedionychis jacobiana* HORN, Trans. Amer. Ent. Soc., vol. 16, 1889, p. 189.

Oval, slightly oblong, surface shining, beneath entirely pale reddish yellow, thorax yellowish, immaculate, elytra pale brown, with large yellow spots. Antennae not reaching the middle of the body, piceous, the three basal joints and half the fourth pale, the terminal also yellow. Occiput piceous, front pale, frontal carina moderately prominent, tubercles distinct, a well-marked impressed line between the eyes, a few coarse punctures on each side near the eyes. Thorax more than twice as wide as long, narrowed in front, base scarcely wider than middle, margin rather broad, reticulate when viewed with transmitted light, anterior angles dentiform, surface almost absolutely smooth, yellow, immaculate; scutellum piceous. Elytra a little wider at base than the thorax, humeri obtuse, umbone moderately prominent, smooth, limited within by a rather deep impression, lateral margin narrowly explanate, surface shining, sparsely rather finely punctate near base, smooth at apex, color pale brown with large yellow spots, the first basal of irregular outline, leaving the umbone brown, behind this two smaller oval spots, followed by a broad sinuous fascia interrupted by the suture, near the apex a spot

of semioval form. Abdomen shining, sparsely, obsoletely, coarsely punctate. Legs entirely reddish yellow.

*Length*.—0.25 inch (6.5 mm.).

*Type locality*.—Southern Arizona.

*Distribution*.—Southern Arizona.

This species was not examined by me and the description is copied from Horn.

E. T. Cresson, who has kindly compared specimens for me, finds that it differs from the Mexican species *Oe. 10-guttata* by having the second row of pale spots on the elytra transverse and not oblique.

### 8. OEDIONYCHIS AEMULA Horn

Fig. 13

*Oedionychis aemula* HORN, Trans. Amer. Ent. Soc., vol. 16, 1889, p. 185.

Oblong-oval, faintly shining, pale yellow with black-spotted or banded pronotum, each elytron with three black vittae, a common sutural, a median, and a submarginal, the submarginal being only on posterior half. Antennae not half the length of body, rather stout, piceous, third joint slightly longer than fourth. Head shining black, with yellow spot between eyes, coarsely punctate about eyes and pale spot, median groove short and indistinct, interocular space half as wide as head. Pronotum over twice as wide as long, narrowed slightly anteriorly, with narrow margin having nearly straight sides, very faintly punctate; five more or less distinct black spots, sometimes united to form fascia. Scutellum rounded, black, shining. Elytra oblong-oval, with very narrow margin and slightly rounded humeral prominences, and faint trace of sulcus; faintly punctate; a rather narrow sutural vitta extending to apex, a median vitta a little broader on each elytron, not reaching apex, and a very narrow marginal vitta beginning at middle and extending nearly to apex, these vittae having a bluish or purplish luster. Body beneath finely pubescent, reddish brown or piceous except for yellow prosternum and yellow tip and margin to abdomen, in this resembling *vians*; legs dark brown or piceous, outer edge of hind legs darker; epipleura piceous.

*Length*.—5 mm.; width 3 mm.

*Type locality*.—Arizona.

*Distribution*.—Arizona.

In the British Museum is a type specimen of *Oe. dugesi* Jacoby from Mexico which closely resembles *Oe. aemula* except for elytral markings. The elytra are entirely green (blue or green, according to Jacoby's description) with pale yellow margin. It is possible that *Oe. dugesi* is a dark nonvittate form of *aemula*. Similar variation has long been known in *Oe. interjectionis*.

## 9. OEDIONYCHIS THORACICA (Fabricius)

Fig. 7.

*Attica thoracica* FABRICIUS, Syst. Ent. App., 1775, p. 821.—OLIVIER, Ent., vol. 6, 1808, p. 678.

*Chrysomela flava* GMELIN, Syst., vol. 1, pt. 4, 1790, p. 1691.

*Oedionychis thoracica* CROTCH, Proc. Acad. Philadelphia, vol. 25, 1873, p. 62.—HORN, Trans. Amer. Ent. Soc., vol. 16, 1889, p. 181.

Broadly oblong-oval, slightly convex, feebly shining, yellow with piceous-spotted pronotum and blue or purple elytra having narrow yellow margin in basal half. Antennae barely half length of body, moderately stout, third and fourth joints about equal, piceous, basal joints usually lighter. Head pale yellow or yellowish brown, sometimes with dark spot in middle of occiput, usually coarsely punctate except on occiput, occasionally entirely punctate; front flat with tubercles and median groove indistinct; interocular space over half width of head. Pronotum over twice as wide as long, nearly rectangular, having narrow explanate margin with arcuate sides, narrowed anteriorly, deeply and densely punctate, usually seven-spotted, the spots piceous, often partly or wholly uniting to form a zigzag fascia. Scutellum rounded, shining, piceous. Elytra broadly oblong-oval with almost parallel sides; humeri rounded and a slight trace of basal depression within, punctations shallow, dense, moderately coarse and sometimes confluent, finer toward apex; color dark purple or blue, with narrow yellow margin in basal half of elytra. Body beneath yellow brown, finely pubescent, tibiae and tarsi darker brown, epipleura pale.

*Length*.—6 to 8 mm.; width 3 to 4 mm.

*Type locality*.—America.

*Distribution*.—New Hampshire, Massachusetts, New York, Rhode Island, Connecticut, Pennsylvania, New Jersey, Delaware, Maryland, District of Columbia, Virginia, West Virginia, Kentucky, Indiana, North Carolina, Georgia, Florida, Texas, and Kansas.

This, the first species of North American *Oedionychis* to be described, is very uniform in its appearance and subject to few variations over its wide range.

## 10. OEDIONYCHIS FIMBRIATA (Forster)

Fig. 11

*Chrysomela fimbriata* FORSTER, Nov. Spec. Ins., vol. 1, 1781, p. 25.

*Attica suturella* SAY, Journ. Acad. Philadelphia, vol. 5, 1826, p. 299.

*Oedionychis circumcincta* CROTCH, Proc. Acad. Philadelphia, vol. 25, 1873, p. 62.

*Oedionychis fimbriata* HORN, Trans. Amer. Ent. Soc., vol. 16, 1889, p. 184.

Elongate-oval, slightly convex, dull red fading to yellow brown with indefinite dark brown or piceous spots on pronotum sometimes

uniting to form large rounded blotch, and very narrow sutural vitta, and in dark form a wide median vitta and narrow marginal one on each elytron. Antennae half length of body, stout, reddish brown basal joints deepening to piceous outer joints, third joint longer than fourth. Head varying from pale brown in paler forms to nearly black in vittate forms, in this dark form resembling *Oe. vians* in having two obscure reddish brown frontal spots, these spots often widening to leave only a narrow dark interocular band and a dark band or spot on posterior part of occiput; coarsely punctate except on middle of occiput; median depression rather indistinct, interocular space over half as wide as head. Pronotum twice as wide as long, nearly rectangular, narrowed anteriorly with straight sides; explanate margin very narrow, punctations distinct and not dense; five dark brown or piceous spots, frequently uniting to form a rounded blotch or even a broad fascia. Scutellum rounded, piceous. Elytra elongate-oblong, moderately convex, with narrow margin; humeri rounded, a distinct basal sulcus within; punctation variable; usually shallow and moderately coarse, smoother toward apex; in paler forms at most only faint trace of vittae, usually a darker area surrounding scutellum, and piceous sutural edges forming a narrow vitta; in vittate forms a broad piceous median vitta nearly covering each elytron, but not reaching apex, and narrow piceous margin uniting with sutural vitta. Body beneath finely pubescent, abdomen and prosternum reddish yellow, meso- and metasterna and tibiae and tarsi dark brown or piceous, outer edge of femora sometimes darker, epipleura pale.

*Length*.—5 to 7 mm.; width 2.5 to 3 mm.

*Type locality*.—North America.

*Distribution*.—Massachusetts, New York, Maryland, District of Columbia, Virginia, Ohio, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, and Texas.

#### 11. OEDIONYCHIS GIBBITARSA (Say)

Fig. 9

*Altica gibbittarsa* SAY, Journ. Acad. Philadelphia, vol. 4, 1824, p. 83.

*Oedionychis gibbittarsa* CROUCH, Proc. Acad. Philadelphia, vol. 25, 1873, p. 60.—HORN, Trans. Amer. Ent. Soc., vol. 16, 1889, p. 181.

Rounded oblong-oval, moderately convex, very lustrous, head and pronotum yellow brown, pronotum usually with piceous spots, elytra green, blue, or purple. Antennae about half as long as body, moderately stout, piceous, basal joints lighter, third and fourth joints about equal. Head nearly smooth, rather finely punctate on front and about eyes; front flat with tubercles and median depression indistinct, interocular space half width of head. Pronotum nearly three times as wide as long, almost rectangular, with wide explanate mar-



gin, slightly arcuately narrowed anteriorly; impunctate; from two to five piceous spots across pronotum, sometimes united to form fascia, or occasionally disappearing entirely. Scutellum rounded, shining, black. Elytra rounded oblong, with narrow margin, and with rounded humeral prominences and basal sulcus within, sometimes nearly impunctate, usually lightly but not densely punctate; very lustrous, varying in color from purple to bluish green or green. Body beneath sparsely pubescent, shining yellow or reddish yellow; tibiae and tarsi usually reddish or piceous; epipleura usually piceous.

*Length*.—5 to 7.5 mm.; width 2.5 to 4 mm.

*Type locality*.—Missouri.

*Distribution*.—Massachusetts, Rhode Island, New York, Pennsylvania, Ohio, Tennessee, Indiana, Illinois, Michigan, Iowa, Kansas, Missouri, Oklahoma, Maryland, District of Columbia, Florida, and Texas.

The bluish green or green form is more common in the north, while the purplish one is more southern. The spots on pronotum are often reduced in southern specimens. In one specimen from Kansas the pronotum is banded with a broad, piceous fascia, leaving only narrow pale margins.

L. G. Gentner found the beetle feeding on a mint, *Teucrium canadense*, in Michigan. E. M. Craighead also records finding both larvae and adult beetles feeding on an "undetermined mint" in Pennsylvania.

## 12. OEDIONYCHIS FLAVOCYANEA Crotch

Fig. 10

*Oedionychis flavocyanea* CROUCH, Proc. Acad. Philadelphia, vol. 25, 1873, p. 62.—HORN, Trans. Amer. Ent. Soc., vol. 16, 1889, p. 181.

Rounded oblong-oval, moderately convex, very shining, pronotum yellow brown with piceous markings, elytra greenish blue or purple having a narrow yellow margin. Antennae not half the length of body, moderately stout, third and fourth joints about equal, basal joints and terminal joint lighter colored. Head reddish brown, deeply and coarsely punctate except on middle of occiput; median depression short and distinct, interocular space over half width of head. Pronotum nearly three times as wide as long, convex, with moderately broad explanate margin arcuately narrowed anteriorly, faintly and sparsely punctate; a median piceous spot, sometimes a smaller spot on either side. Scutellum rounded, black and shining. Elytra rounded oval, with rounded humeral prominences and basal depression within, coarsely and shallowly punctate, smoother toward apex; shining, bluish green or purple, with moderately wide yellow margin. Body beneath shining reddish brown, sparsely pubescent; epipleura piceous.

*Length*.—5 mm.; width 3 mm.

*Type locality*.—Texas.

*Distribution*.—Texas.

This species closely resembles *gibbitarsa*, but differs in its reddish brown, coarsely punctate head, the yellow margin about elytra, and the coarser, deeper punctation.

### 13. OEDIONYCHIS LATERALIS Jacoby

Fig. 8

*Oedionychis lateralis* JACOBY, Biol. Cent. Amer., Coleopt., vol. 6, pt. 1, 1886, p. 412.

Broadly oblong-oval, shining, head yellow, pronotum yellow, usually indistinctly marked with from three to five pale reddish brown spots, elytra dark blue, bluish green or purplish, with yellow margin widening at apex and forming a scalloped pattern, body beneath also yellow. Antennae not half the length of body, stout, piceous, basal joints and terminal joint paler, third joint a little shorter than fourth. Head deep yellow, somewhat cribrately punctate on either side of occiput, occiput nearly smooth, median groove short but distinct, interocular space about half width of head. Pronotum about three times as wide as long, with moderately wide explanate margin, shining, paler yellow than head, very faintly and finely punctate, usually having from three to five pale reddish brown spots, these often obscure. Scutellum rounded, piceous. Elytra oblong-oval, with distinct humeral prominences with basal sulcus; finely, densely and usually shallowly punctate, sometimes rather coarsely punctate, shining; deep blue with green or violet luster, and with narrow yellow margin widening at apex and forming a scalloped pattern. Body beneath finely pubescent, shining, reddish yellow, epipleura pale yellow with piceous edges.

*Length*.—6 to 7 mm.; width 3 to 3.5 mm.

*Type locality*.—Oaxaca, Mexico.

*Distribution*.—Baboquivari Mountains, Ariz.

This species was described by Jacoby from Oaxaca, Mexico. I have examined specimens collected by the late F. H. Snow in southwestern Arizona and preserved in the collection of the University of Kansas. *Oe. lateralis* closely resembles several other Central American species. *Oe. extrema* Harold has a dark head, a distinct apical spot, and narrow yellow margin. *Oe. högei* Jacoby has a yellow head and similar apical markings but no pale elytral margin, and *Oe. purulensis* is similar to *högei* but with a black head. Of the species found north of Mexico, it bears a resemblance to *Oe. thoracica*, but differs in being smoother and shining, having less distinct thoracic spots and an entirely pale margin and apical pattern.

## 14. OEDIONYCHIS TENUILINEATA Horn

Fig. 15

*Oedionychis tenuilineata* HORN, Trans. Amer. Ent. Soc., vol. 16, 1889, p. 186.

Broadly oblong, slightly convex, moderately shining, yellow brown, pronotum indistinctly spotted, elytra with two narrow vittae and common sutural vitta, these often with a purplish or greenish luster. Antennae half as long as body, rather coarse, first joint broadly dilated and sparsely pubescent, third and fourth joints equal, first three joints and terminal joint paler. Head broad, reddish brown, coarsely punctate except on middle of occiput; median depression indistinct, interocular space half as wide as head. Pronotum nearly three times as wide as long, almost rectangular, slightly narrowed anteriorly, with broad explanate margin, very faintly punctate; small, somewhat indeterminate, pale reddish brown spots across pronotum, not forming a distinct fascia. Scutellum black. Elytra broad, oblong, slightly convex, with small rounded humeral prominences and narrow margin, finely punctate, surface shining; a common, narrow sutural vitta extending to apex, a narrow median vitta on each elytron not quite reaching apex, and a narrow submarginal vitta starting from the humeral prominence and nearly but not quite uniting with sutural vitta at apex, these vittae frequently with a purplish or greenish luster. Body beneath reddish brown, pubescent, epipleura pale.

*Length*.—5.5 to 7 mm.; width, 2.8 to 3.8 mm.

*Type locality*.—Southern Arizona.

*Distribution*.—Arizona.

According to Horn, the last antennal joint in the female is entirely pale, whereas in the male only the tip of the last joint is pale. This species is readily distinguished from *Oe. petaurista* by its flatter prothorax with wide explanate margin and without the heavy fascia or median blotch so characteristic of *petaurista*. The elytral vittae as a rule are very narrow, although in some specimens they are as broad as in *petaurista*.

## 15. OEDIONYCHIS PETAURISTA (Fabricius)

Figs. 16, 17

*Galleruca petaurista* FABRICIUS, Syst. Eleuth., vol. 1, 1801, p. 495.

*Altica petaurista* OLIVIER, Ent., vol. 6, 1808, p. 674.

*Oedionychis petaurista* CROTCH, Proc. Acad. Philadelphia, vol. 25, 1873, p. 62.—

HABOLD, Deutsche Ent. Zeitschr., vol. 25, 1881, p. 150.—HORN, Trans. Amer. Ent. Soc., vol. 16, 1889, p. 185.

Broadly oval, convex, moderately shining, yellow brown with reddish brown head, pronotum with a piceous median spot or band, elytra with a common sutural vitta and median and submarginal

vittae. Antennae rather stout, not half so long as body, dark brown, basal joints paler, third and fourth joints equal. Head broad, reddish brown, coarsely and somewhat cribrately punctate except on middle of occiput, finely pubescent about eyes; median groove usually distinct, interocular space about half width of head. Pronotum nearly three times as wide as long, arcuately narrowed anteriorly, moderately convex, finely punctate, with rather narrow explanate margin; an irregular piceous blotch often widening to a broad scalloped fascia in middle. Scutellum rounded, shining, black. Elytra broadly oval, convex, shining, punctate, punctation varying from coarse punctures, tending to be confluent, to fine and shallow; margin narrowly explanate, humeri rounded; usually five moderately broad vittae on elytra—a common sutural vitta, a median vitta, and a submarginal vitta curving over humerus on each elytron, these last two vittae not quite reaching apex, color of vittae usually greenish black or piceous, occasionally with a bronze or purple luster. Body beneath yellowish or reddish brown, finely pubescent, epipleura more or less piceous.

*Length*.—7.5 to 8 mm.; width, 2.5 to 4.5 mm.

*Type locality*.—Carolina.

*Distribution*.—Pennsylvania, District of Columbia, Maryland, "Carolina," North Carolina, Georgia, Florida, Alabama, Kentucky, Mississippi, Oklahoma, Kansas, Texas.

Horn described a variety *brevilineata* from Florida "in which with an entirely pale margin the disk is black or slightly bluish with a short yellow vitta beginning within the humeral umbone." At the opposite extreme there is a pale variety, which may be called

OEDIONYCHIS PETAURISTA PALLIDA, new variety

Head and antennae as in typical *petaurista*; pronotum with very pale reddish brown spot or blotch, smaller than usual in typical *petaurista*; elytra entirely lacking the median vittae, and with very narrow sutural and submarginal vittae, producing an elytral pattern closely resembling *Lema trilineata*.

*Type and 1 paratype*.—Cat. No. 29156, U.S.N.M.

*Type locality*.—Tyler, Tex.

*Distribution*.—Texas and Oklahoma.

Described from two specimens in the National Museum, one from Tyler, Tex., W. D. Pierce collection; the second labeled Ardmore, Indian Territory (now Oklahoma), C. R. Jones collection.

In Horn's collection are two specimens with the median vittae interrupted, that is, represented only by traces, and the submarginal vittae very narrow.<sup>18</sup> Apparently, as in other vittate species of

<sup>18</sup> See illustration, Trans. Amer. Ent. Soc., vol. 16, pl. 5, fig. 2.

this genus, there is great variability, and a large series of each species is necessary to understand and illustrate the many forms.

*Oedionychis petaurista* has been found feeding on *Verbena* species in Washington, D. C., and W. S. Blatchley reports it on strawberry and bitterweed (? *Helenium* species) in Florida. It is also reported as feeding on *Verbascum thapsus* and *Cassia* species.

In the National Museum are two specimens that superficially resemble *petaurista* but are probably not that species. They do not agree very closely with any of the vittate species described by Von Harold, but without examination of his types it is impossible to be sure that they do not belong to one of these. The species differs from *petaurista* in the more oblong shape, due to the wider prothorax which narrows only little anteriorly, and is fully three times as wide as long. The species also differs from *petaurista* in the more truly marginal outer elytral vittae, which are very narrow, not curving over humeral prominences or on sides of elytra, but almost confined to the explanate margin, although the outer edge of the margin is yellow. From above this narrow dark vitta is not readily seen. The third antennal joint in both specimens is slightly shorter than the fourth. The head in one is deep reddish brown, almost piceous, becoming paler on clypeus, and coarsely punctate throughout, and in the other yellow brown and smooth on occiput. The pronotum in both has a wide, undulated fascia. As in *petaurista*, none of the elytral vittae quite reaches apex. The punctuation is fine and shallow; and the surface more shining than is usual in *petaurista*. The ventral surface is yellowish or reddish, and the epipleura differ from those of *petaurista* in being pale. Length 6 mm., width 3 mm. Both specimens were collected in Florida. (Haw Creek, Hubbard and Schwarz; Sunny Hill, in stomach of quail.)

16. *OEDIONYCHIS AMPLIVITTATA*, new species

Fig. 14.

Oblong-oval, moderately convex, shining, head mostly dark except for yellow margin about eyes, pronotum broadly explanate, yellow with a small, irregular spot on either side or these spots united into a large central blotch, elytra yellow with wide, black, sutural vitta and wide lateral vitta. Antennae stout, piceous, not half so long as body, third joint a little longer than fourth. Head shining, occiput and front covered with a large piceous spot, often with a metallic luster, and leaving only margin about eyes yellow; a deep median and transverse groove on front. Pronotum nearly three times as wide as long, with wide, slightly reflexed, explanate margin; shining, a few indistinct, scattered punctures; yellow with a reddish

brown, irregular spot on either side or these united into a large blotch. Scutellum rounded, shining, black. Elytra broad with wide, rounded apex and moderately wide explanate margin; humeral prominences rounded but not marked, basal sulcus within; punctation indistinct, fine and sparse, deeper punctures along suture and in basal sulcus; a wide, black, sutural vitta at base covering one-third of either elytron and tapering to apex, and a lateral vitta, gradually widening from humeri and covering at middle half of elytron, leaving narrow, yellow, median space of regular width and only half as wide as lateral and sutural vittae; explanate margin yellow; sutural vitta not quite reaching apex, lateral vittae truncate before reaching apex. Body beneath finely pubescent, piceous except for yellow epipleura and margin of prosternum.

*Length*.—7 to 7.5 mm.; width 4 to 4.5 mm.

*Type*.—In British Museum. Paratype, Cat. No. 29354 U.S.N.M.

*Type locality*.—North America.

Described from two specimens from the DeJean collection in the British Museum, labeled *Oe. petaurista* from "Amer. bor." Permission has kindly been granted to deposit the paratype in the United States National Museum. The shape of the prothorax with its wide explanate margin and the broadly arcuate elytra, wider below the middle, as well as the markings on head and elytra, differentiate this from *petaurista*. It is much larger than *Oe. miniata*, as well as having pale yellow markings above and being deeply piceous below, with elytral vittae much wider and closer to the margin. This can not be *Oe. horni* because von Harold describes that species as being densely punctate and not shining, comparing it with *miniata*, which he says is much more finely punctate. On the contrary, *Oe. ampli-vittata* is remarkable for being smooth and shining. The species may prove to be a Central American one.

#### 17. OEDIONYCHIS MINIATA (Fabricius)

Figs. 18, 19

*Galleruca miniata* FABRICIUS, Syst. Eleuth., vol. 1, 1801, p. 495.

*Altica miniata* OLIVIER, Ent., vol. 6, 1808, p. 635.

*Oedionychis fallax* MELSHEIMER, Proc. Acad. Philadelphia, vol. 3, 1847, p. 162.

*Oedionychis miniata* CROUCH, Proc. Acad. Philadelphia, vol. 25, 1873, p. 62.—

HORN, Trans. Amer. Ent. Soc., vol. 16, 1889, p. 187.

Broadly oblong-oval, convex, moderately shining, yellow brown with reddish brown band across pronotum, a reddish brown or piceous common sutural vitta and a median vitta on each elytron. Antennae barely half length of body, stout, reddish brown, or darker, three basal joints reddish, third joint shorter than fourth. Head reddish-brown, coarsely punctate, sometimes occiput and surface

along median groove smooth; interocular space more than half as wide as head, median groove tending to be indistinct in coarsely punctate specimens. Pronotum over twice as wide as long, convex, arcuately narrowed anteriorly, with very narrow explanate margin, distinctly but finely punctate; a broad, reddish brown band of irregular, usually scalloped, outline. Scutellum rounded, reddish brown or piceous. Elytra oblong, convex, with sides nearly parallel; humeral prominences rounded with trace of sulcus within at base of elytra; margin very narrow; punctations coarse but usually not deep; a common reddish brown or piceous sutural vitta of varying width and a median vitta on each elytron, also varying in width, not quite reaching apex. Body beneath reddish brown, finely pubescent; epipleura more or less piceous.

*Length*.—4 to 7 mm.; width 2 to 3.5 mm.

*Type locality*.—Carolina.

*Distribution*.—Massachusetts, Rhode Island, New Jersey, Maryland, Virginia, "Carolina," Georgia, Florida, Louisiana, Alabama, Mississippi, Texas, Kansas, Missouri, Nebraska, Iowa, Illinois.

In the Bosc collection at Paris there are three specimens, all similar in markings, and one bearing on the label the name *miniata*. They represent cotypes of the Fabrician species. The specimen bearing the label has the third antennal joint shorter than the fourth, and the head moderately coarsely punctate. The pronotum is rather faintly marked with a wide reddish brown fascia, and the elytral vittae are very narrow, the sutural vitta being scarcely more than the darkened sutural edges. The specimen is 5.2 mm. long and 3 mm. wide.

There is great variability in this species, as in other vittate species of this group, both in size and shape, and in the width of the elytral vittae. It is possible that several of von Harold's species that are not identified in this country may be forms of *Oe. miniata*. In the National Museum is a series of six specimens from Florida and Mississippi strikingly different from the majority. They are smaller and more slender than the others and the vittae are very narrow. At the other extreme is the rounded dark form, with very wide vittae, that Horn called *Oe. ulkei*, which may not be specifically distinct. He differentiated this from *miniata* on the grounds of its smaller size, its smoother head, and the equality of the third and fourth antennal joints. Examination of a series of specimens shows that there is not only gradation in size of beetle and punctation of head, but even in the length of the third and fourth antennal joints, these two joints being rarely equal but varying from subequal to very unequal with the fourth joint nearly twice as long as the third.

W. S. Blatchley collected this species on dwarf huckleberry (*Gaylussacia* species).

## 18. OEDIONYCHIS ULKEI Horn

Fig. 20

*Oedionychis ulkei* HORN, Trans. Amer. Ent. Soc., vol. 16, 1889, p. 188.

Oval, convex, moderately shining, yellowish or appearing brown because of the usually wide reddish brown markings, a broad fascia across pronotum and wide sutural vitta and vitta in middle of each elytron. Antennae nearly half as long as body, stout, reddish brown, three basal joints paler, third and fourth joints subequal. Head reddish brown, moderately coarsely punctate, middle of occiput usually smooth and shining; median groove rather indistinct, interocular space more than half width of head. Pronotum about three times as wide as long, convex, narrowed anteriorly, with narrow explanate margin; finely but distinctly punctate; a wide reddish brown fascia. Scutellum reddish brown or piceous. Elytra rounded oblong, convex, sides nearly parallel; humeral prominences rounded, with faint depression within, margin very narrow; punctation coarse but shallow; a common entire sutural vitta reddish brown or piceous and of varying width, and a usually broad median vitta on each elytron, not quite reaching apex, occasionally uniting at some points below middle with sutural vitta. Body beneath reddish brown, finely pubescent, epipleura more or less piceous.

*Length*.—4 to 5.5 mm.; width 2 to 3 mm.

*Type locality*.—Florida.

*Distribution*.—Florida.

This species is closely allied to *miniata*, the only differences being in the length of the third and fourth antennal joints and the generally smaller size and more rounded outline. The punctation of the head is usually sparser. In some instances these differences do not appear sharply distinctive, and it is questionable whether *Oe. ulkei* is not a variety of *miniata*.

W. S. Blatchley found this species on flowers of *Desmothamnus* and other Ericaceae.

## 19. OEDIONYCHIS INDIGOPTERA LeConte

Fig. 21

*Oedionychis indigoptera* LECONTE, Proc. Amer. Philos. Soc., vol. 17, 1878, p. 416.—HORN, Trans. Amer. Ent. Soc., vol. 16, 1889, p. 190.

Elongate oval, moderately shining, with dark reddish brown head and pronotum and dark blue elytra. Antennae slender, half length of body, reddish brown, basal joints slightly paler, third and fourth joints about equal. Head finely punctate, median groove indistinct, interocular space less than half width of head, eyes large. Pronotum a little over twice as wide as long, feebly convex, narrowed arcuately



anteriorly, with narrow explanate margin, faintly punctate. Scutellum piceous. Elytra rounded, elongate, not wider at base than prothorax, with scarcely perceptible margin, and slight trace of humeral prominences and depression within; punctation coarse and shallow, finer toward apex; entirely dark blue. Body and legs beneath dark brown, finely pubescent; epipleura piceous.

*Length*.—4 to 4.5 mm.; width 2 to 2.2 mm.

*Type locality*.—Tampa, Fla.

*Distribution*.—Georgia, Florida, "Pennsylvania" (British Museum).

This species comes nearest *thyamoides* in shape and in lack of humeral or other discal prominences, but is more elongate and has narrower margins, narrower thorax, and larger eyes, and the elytra are entirely blue with no trace of yellow brown.

#### 20. OEDIONYCHIS THYAMOIDES Crotch

Figs. 22 and 23

*Oedionychis thyamoides* CROTCH, Proc. Acad. Philadelphia, vol. 25, 1873, p. 63.—HORN, Trans. Amer. Ent. Soc., vol. 16, 1889, p. 191.

Oval, moderately shining, yellow brown, elytra with bronze-black or blue-black oval central area of varying size. Antennae over half as long as body, slender, darker at tip, third and fourth joints equal. Head faintly and finely punctate, median groove tending to be indistinct, interocular space half as wide as head. Pronotum over twice as wide as long, rounded, feebly convex, with wide explanate margin, arcuately narrowed anteriorly; shining, nearly impunctate. Scutellum black. Elytra rounded oval, with feeble humeral prominences and moderately wide margin; punctation usually dense and moderately coarse; a broad, oval, bronze or blue-black central area of variable size, sometimes nearly covering elytra except for margin, again narrowed to a broad sutural vitta extending over half of elytra, never reaching apex. Body beneath yellow brown or reddish, finely pubescent, epipleura pale.

*Length*.—3 to 4.5 mm.; width 1.7 to 2.5 mm.

*Type locality*.—Western States.

*Distribution*.—Colorado, Kansas, Iowa, Tennessee, Ohio, Maryland, Louisiana, Mississippi, and Texas.

In shape this species is nearest *Oe. indigoptera*, but it has much smaller eyes and there is always a yellow brown margin to the elytra. In the material at hand, the specimens from Louisiana, Mississippi, and Texas appear to be much smoother and more finely punctate and shining and the dark central area nearly covers the elytra, leaving only a very narrow yellow margin.

It has been collected on *Teucrium canadense*.

## 21. OEDIONYCHIS TEXANA Crotch

Fig. 24

*Oedionychis texana* CROTCH, Proc. Acad. Philadelphia, vol. 25, 1873, p. 63.—  
HORN, Proc. Amer. Ent. Soc., vol. 16, 1889, p. 191.

Elongate oblong-oval, moderately shining, yellow, usually with darker brown head, elytra with piceous sutural vitta and sometimes a median vitta, the latter often abbreviated or sometimes disappearing entirely. Antennae slender, over half as long as body, basal joints reddish brown, outer ones darker, third joint sometimes a little shorter than fourth. Head usually reddish brown on occiput, finely punctate, interocular space half width of head, median groove indistinct. Pronotum barely twice as wide as long, only slightly narrowed anteriorly, with narrow explanate margin; very faintly punctate. Scutellum piceous. Elytra oblong, scarcely wider at base than prothorax, with very faint trace of humeral prominences, and sides nearly parallel; margin narrowly explanate; punctations fine and shallow, nearly smooth at apex; a piceous sutural vitta of varying width extending to apex and occasionally two other vittae, one in middle of each elytron, these often abbreviated or united with sutural vitta, or disappearing entirely, never reaching apex. Body beneath deeper yellow, finely pubescent, epipleura pale.

*Length.*—3 to 5 mm.; width 1.5 to 2.5 mm.

*Type locality.*—Texas.

*Distribution.*—Texas.

## 22. OEDIONYCHIS FLAVIDA Horn

Fig. 25

*Oedionychis flavida* HORN, Trans. Amer. Ent. Soc., vol. 16, 1889, p. 190.

Elongate-oblong with sides nearly parallel, moderately shining, pale yellow, nearly impunctate. Antennae slender, about half as long as body, pale, outer joints slightly darker but not piceous, third joint shorter than fourth. Head pale, entirely smooth and shining, with deep transverse but no vertical median groove; interocular space half width of head. Pronotum over twice as wide as long, with arcuate sides and rather narrow explanate margin; narrowed slightly anteriorly making apex and base nearly the same width; shining, immaculate, impunctate. Scutellum slightly darker yellow brown. Elytra elongate, narrow, with sides nearly parallel; humeral prominences and sulcus within not at all marked; explanate margin not wide; pale yellow, moderately shining and smooth. Body beneath finely pubescent, deeper yellow brown, epipleura pale.

*Length.*—4 to 5 mm.; width 2.5 mm.

*Type locality.*—El Paso, Tex.

*Distribution.*—Texas, New Mexico.

Besides being the only entirely pale species known to occur north of Mexico, *Oe. flavida* is remarkable for its narrow oblong shape, by which it is differentiated from the several Central American pale, unicolorous species. The small, pale Central American species usually also differ in having antennae with deeply piceous outer joints.

23. *OEDIONYCHIS SALTATRA* Blatchley

Fig. 26

*Oedionychis saltatra* BLATCHLEY, Can. Ent., vol. 55, 1923, p. 32.

Rounded oval, moderately shining, moderately convex, yellow brown, elytra piceous with very narrow pale margin and apex. Antennae slender, half length of body, basal points pale, third and fourth joints equal. Head faintly and finely punctate, sometimes smooth, median depression well marked, interocular space about half width of head. Pronotum nearly three times as wide as long, very faintly and sparsely punctate, with rounded, explanate margin, narrowed anteriorly. Scutellum black. Elytra rounded oval, with narrow, not reflexed explanate margin, humeral prominences and depression within well marked; rounded and more convex at suture than dark form of *subvittata* or *circumdata*; moderately shining, punctuation shallower and finer than *subvittata* or *quercata*; piceous, apex and narrow edge of margin pale. Body beneath dark brown, shining, sparsely pubescent, epipleura dark.

*Length*.—4 to 5 mm.; width 2 mm.

*Type locality*.—Dunedin, Fla.

*Distribution*.—Florida.

This species is very closely allied to *Oe. quercata* and appears to differ from it principally by its narrower explanate margin and traces of yellow brown on elytra, especially at apex. It has, too, smoother and more shining elytra than *quercata*. It differs from *Oe. circumdata* by being more convex and having arcuate elytra and

24. *OEDIONYCHIS QUERCATA* (Fabricius)

Fig. 27

*Galleruca quercata* FABRICIUS, Syst. Eleuth., vol. 1, 1801, p. 495.

*Altica quercata* OLIVIER, Ent., vol. 6, 1808, p. 687.

*Oedionychis quercata* CLARK, Catalogue of Halticidae, Journ. Ent., vol. 2, 1866, p. 167. (Not *quercata* of American authors.)

Rounded oval, moderately shining, head and prothorax reddish brown, elytra deep black, sometimes with ferruginous margin. Antennae slender, half length of body, third and fourth antennal joints nearly equal or third often a little shorter. Head reddish brown without occipital spot, finely and sparsely punctate, median impres-

sion short, often indistinct; interocular space about half width of head. Pronotum over twice as wide as long, with wide, explanate margin, sparsely and faintly punctate, reddish brown. Scutellum black. Elytra slightly convex, rounded oval, with moderately wide explanate margin, humeral prominences and basal callosities near suture well marked, with deep sulcus between: punctation shallow, fine, coarser at base; color entirely deep black, with no trace of yellow brown on margin or apex, margin sometimes deep reddish brown but not so light reddish brown as head and prothorax, moderately shining. Body beneath finely pubescent, shining dark brown, epipleura reddish brown.

*Length*.—4 to 5 mm.; width 2 to 2.5 mm.

*Type locality*.—Carolina.

*Distribution*.—Virginia, "Carolina," Florida, Alabama, Louisiana.

The name *Oedionychis quercata* was applied by Horn, who has been followed by most authors, to the species here treated as *circumdata* Randall. The writer examined the Bosc collection at the Paris Museum, and found the species there labeled *quercata* to be quite unlike Horn's concept of the species. Fabricius' description of the species as having immaculate, ferruginous head and prothorax and black elytra with ferruginous margin corresponds perfectly with the specimen at Paris. There is no trace of a yellow brown margin to the elytra. Again, contrary to Horn's description, the sides of the elytra are distinctly arcuate, in this respect resembling *Oe. subvittata*. Olivier's illustration, while correct, may have been misleading because of the too sharp distinction in color between the dark elytra and the red elytral margin. ~~Examination of the Bosc specimen~~ shows that this apparent difference in color is due simply to a thinning of the margin, which thereby appears deep reddish brown but not so light reddish brown as the head or prothorax. This is not the case in all specimens. The measurements of the Bosc specimen are: Length 4 mm., width 2.5 mm.; and the locality is simply "Carolina."

*Oe. circumdata* (confused by Horn with *quercata*) differs in shape, having elytra with more parallel sides, and in color, the head, prothorax, and elytral margins being yellow brown, and the head frequently with a darker spot on occiput. *Oe. quercata* differs from both *Oe. subvittata* (dark form) and *saltatra* by having no yellow brown on head, prothorax, or elytral margins, and no darker occipital spot.

#### 25. OEDIONYCHIS PERVITTATA, new species

Fig. 28

Rounded oval, moderately shining, yellow brown with a broad, black lateral vitta on each elytron, widening in lower half and ex-

tending from humerus nearly to apex of elytra, and a short, broad, slightly inwardly curved median vitta extending from base to about one-seventh length of elytra. Antennae slender, over half length of body, basal joints yellow brown, outer joints gradually darkening, third and fourth joints equal. Head with darker spot on occiput, finely punctate; median groove faint, interocular space over half width of head. Pronotum over twice as wide as long, arcuately narrowed anteriorly, with broad explanate margin, faintly punctate. Scutellum piceous. Elytra with sides feebly rounded, and with wide, explanate margin; humeri well marked and a sulcus within; punctuation fine and dense; from either humeral prominence a gradually widening, black vitta extending nearly to apex, in posterior half of elytra covering over half of elytra, a short, broad median vitta extending from base of elytra about one-seventh the length, slightly curved inward. Body beneath finely pubescent, meso- and metasterna and abdomen brown, legs and prosternum yellow brown; epipleura pale.

*Length*.—4.5 mm.; width 2 mm.

*Type and paratype*.—Cat. No. 29157, U.S.N.M.

*Type locality*.—Memphis, Tenn.

*Distribution*.—Tennessee.

Two specimens of this species in the National Museum collected by H. Soltau closely resemble *Oe. subvittata*, but differ in the clear-cut, heavily marked vittae. None of the specimens of *subvittata* examined has so entire or so distinctly marked black vittae. These two specimens are also not so convex, and are more finely punctate ~~and shining, in this respect~~ resembling *Oe. circumdata*, although the sides of elytra are much more arcuate.

## 26. OEDIONYCHIS SUBVITTATA (Horn)

Figs. 29, 30

*Oedionychis limbalis* var. *subvittata* HORN, Trans. Amer. Ent. Soc., vol. 16, 1889, p. 192.

Rounded oval, feebly convex, moderately shining, yellow brown, head usually with darker occipital spot, elytra varying from yellow brown with short brown vittae to reddish brown or more rarely piceous without vittae, the margin always pale. Antennae over half as long as body, slender, basal joints yellowish, last four or five joints dark brown, joints 3 and 4 subequal, third joint sometimes a little shorter. Head usually with darker occiput, finely and faintly punctate, median groove short, tending to be indistinct, interocular space over half width of head, eyes small. Pronotum nearly three times as wide as long, arcuately narrowed anteriorly, with wide,

explanate margin; pale yellow, usually immaculate, but in darker forms sometimes with obscure darker spots or even piceous spots united in form of an irregular fascia; very faintly and sparsely punctate. Scutellum small, reddish brown or piceous. Elytra broadly oval, feebly convex, sides distinctly arcuate, with broad, often reflexed, explanate margin, humeri small, short basal sulcus within; punctuation coarse, moderately deep; elytral markings very variable, frequently pale yellow brown, usually with median reddish brown or dark brown vitta not reaching base or apex and of varying length, often a spot on humeri elongated sometimes to a lateral vitta extending half length of elytron, frequently a short vitta at base near suture, usually not extending more than one-third length of elytra, these vittae often in part disappearing or occasionally widening and uniting to cover most of elytra with only yellow streaks between and paler margin; a form with reddish brown elytra without vittae having somewhat paler margin; sometimes entirely piceous with pale margin. Body beneath finely pubescent, yellow brown, usually with meso- and metasterna and abdomen dark brown, often last ventral segment pale, epipleura pale.

*Length.*—3.5 to 5 mm.; width 2 to 2.5 mm.

*Type locality.*—Not given.

*Distribution.*—Quebec, Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, Pennsylvania, Illinois, Iowa, Wisconsin, Ohio, Michigan, Maryland, Virginia, West Virginia, North Carolina.

Horn, who first described this species as a variety of *Oe. limbalis*, wrote that the striped form seemed the more abundant and that it was remarkable that it had not received a name. Examination of the specimens in Horn's collection labelled *Oe. limbalis* shows no specimens corresponding with Melsheimer's *limbalis*. Horn's *limbalis*, in other words, is the dark form of his variety *subvittata*. *Oe. subvittata*, Horn writes, is the most broadly oval species in our fauna. The head is broad, with wide interocular space, the pronotum is nearly three times as wide as long, the elytra are rounded with wide explanate margin. There are, as Horn also remarked, fewer dark forms; in fact, the black form with pale margin is rare. More frequently the subvittate form becomes reddish brown with more or less indistinct vittate markings. Sometimes the vittae are not discernible, at other times they are very dark reddish brown, or even piceous, and widening at points coalesce in a variety of patterns<sup>19</sup> and occasionally they entirely cover the elytra, leaving the margin pale. The dark form, which is comparatively rare,

<sup>19</sup> See Horn's illustration, pl. 7, fig. 20.

is to be distinguished from *Oe. quercata* by its pale margin. *Oe. quercata*, moreover, has reddish head and prothorax (not yellowish brown), and is without any darker occipital spot. The dark form of *Oe. subvittata* is to be separated from *Oe. saltatra* by its wide elytral margins. It is to be separated from *Oe. circumdata* by its broader and more rounded elytra, the elytra in *Oe. circumdata* tending to be quadrate in shape.

27. *OEDIONYCHIS SEXMACULATA* (Illiger)

Fig. 31

*Haltica sexmaculata* ILLIGER, Mag. f. Insektenkunde, vol. 6, 1807, p. 104.

*Haltica palliata* RANDALL, Bost. Journ. Nat. Hist., vol. 2, 1838, p. 47.

*Oedionychis sexmaculata* CROTCH, Proc. Acad. Philadelphia, vol. 25, 1873, p. 63.—HORN, Trans. Amer. Soc., vol. 16, 1889, p. 193.

Small, oblong, dull yellow brown, deeply and coarsely punctate, the pronotum with piceous or reddish brown spots, and elytra with irregular, zigzag markings and a lateral fold parallel to margin of elytra. Antennae barely half length of body, moderately stout, basal joints paler, third and fourth joints equal. Head with occiput rounded, reddish brown or piceous, front paler, coarsely punctate; median groove not distinct, interocular space half as wide as head. Pronotum nearly three times as wide as long, with wide explanate margin, nearly rectangular, slightly narrowed anteriorly, coarsely punctate; generally two oblique, reddish brown or even piceous marks on either side, sometimes meeting at anterior half, in middle at base a brown spot. Scutellum dark brown. Elytra oblong, narrow, with humeral prominences and a sulcus within continuous nearly to apex, thus forming a lateral fold parallel to margin; margin moderately wide; punctations coarse and deep; a reddish brown or piceous spot on humerus, oblique mark at basal fourth, sometimes meeting and forming a V at suture, a broad marginal spot below this, these marks sometimes running together to form a narrow zigzag across the upper half of elytra, a broad zigzag fascia across lower half of elytra, occasionally breaking up into spots. Body beneath yellow or reddish brown, finely pubescent; epipleura pale.

*Length*.—2.8 to 4 mm.; width 1.5 to 2 mm.

*Type locality*.—Pennsylvania.

*Distribution*.—Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Maryland, District of Columbia, Virginia, North Carolina, Georgia, Florida, Alabama, Louisiana, Texas, Ohio, Indiana, Illinois, Michigan, Missouri, Kansas, Oklahoma, Nebraska.

This is a most distinctive species on account of its small size, its deep, coarse punctation, and the lateral fold on the elytra. It is the

only species of the genus that has been known to occur in sufficient numbers to be an injurious insect. In New York and Connecticut it has been reported as a pest on ash, *Fraxinus* species.<sup>20</sup> H. S. Barber has collected it in numbers at Plummer Island, Maryland, on the fringe-tree (*Chionanthus virginica*).

28. OEDIONYCHIS SUTURALIS (Fabricius)

Fig. 32

*Galleruca suturalis* FABRICIUS, Syst. Eleuth., vol. 1, 1801, p. 499.

*Altica suturalis* OLIVIER, Ent., vol. 6, 1808, p. 692.

*Oedionychis suturalis* HORN, Trans. Amer. Ent. Soc., vol. 16, 1889, p. 193.

Oblong oval, feebly shining, pale yellow or even waxen with reddish brown head and sutural vitta extending three-fourths the length of elytra and spreading across base and extending down over humeral prominences, a spot frequently present in middle of each elytron and sometimes at apical three-fourths, these occasionally uniting with sutural vitta to form fasciae. Antennae over half as long as body, slender, yellow, terminal joints somewhat darker, third joint a little shorter than fourth. Head rounded, reddish brown across occiput and front, densely and somewhat coarsely punctate; median groove short and faint, interocular space nearly half as wide as head. Pronotum over twice as wide as long, narrowed a little anteriorly, with moderately wide, explanate margin somewhat thicker than usual, faintly punctate, yellow, sometimes almost waxen. Scutellum reddish brown. Elytra oblong-oval, with rather narrow explanate margin and rather small humeral prominences forming a sulcus within; coarsely and shallowly punctate; a reddish brown sutural vitta varying in width extending to apical three-fourths and broadening at base to spread over whole base of elytra and down over humeral prominences, frequently a spot in middle of either elytron and often one opposite the apical end of vitta, both of these occasionally uniting with sutural vitta to produce fasciae. Body beneath yellow, finely pubescent; epipleura pale.

*Length*.—3.5 to 4.8 mm.; width 1.8 to 2.5 mm.

*Type locality*.—Carolina.

*Distribution*.—New Jersey, North Carolina, "Carolina," Georgia, Florida.

The fasciate form of the species might be confused with *scalaris*, but the paler coloring, reddish markings, and coarse punctation of the head easily distinguish it.

W. S. Blatchley found it in Florida on the flowers of *Nex glabra*.

<sup>20</sup> Britton, Conn. Rept., vol. 16, 1917, p. 141.



29. *OEDIONYCHIS NIGROSIGNATA* Schaeffer

Fig. 33

*Oedionychis nigrosignata* SCHAEFFER, Journ. New York Ent. Soc., vol. 27, 1919, p. 333.

Elongate oval, pale yellow, moderately shining, with black-spotted elytra. Antennae slender, half the length of body, basal joints paler, third and fourth joints about equal. Head faintly and finely punctate in front, occiput shining, median groove distinct, interocular space less than half width of head. Pronotum over twice as wide as long with a moderately narrow explanate margin, not so thinly transparent as in *scalaris*, arcuately narrowed anteriorly, shining, very faintly punctate. Scutellum pale. Elytra elongate oval, with slight humeral prominences, and narrow margin, shining, nearly impunctate; on each elytron black spots or blotches as follows: On humeral prominence, a common spot at basal fourth at suture, sometimes in part disappearing, one opposite this medially, a larger blotch a little below middle, one on lateral margin, and one at apical fourth in middle, these spots varying in size and sometimes in part disappearing. Body beneath finely pubescent, pale.

*Length*.—4.5 to 5.5 mm.; width 2.5 mm.

*Type locality*.—Brownsville, Tex.

*Distribution*.—Texas.

This species is generally narrower than *scalaris*, and is smooth and shining. It differs also in the narrower margin of the prothorax and in having feebly marked humeral prominences.

30. *OEDIONYCHIS SPILONOTA*, new species

Fig. 34

Elongate oval, feebly shining, yellow with piceous sutural vitta, this not reaching apex, each elytron with a narrow black basal edging and five or six black spots. Antennae slender, half length of body, pale, third and fourth joints nearly equal, the fourth slightly longer. Head finely and rather densely punctate, a piceous spot on occiput; median depression distinct, interocular space a little less than half width of head. Pronotum over twice as wide as long with moderately wide explanate margin, arcuately narrowed anteriorly, shining, with few, scattered, indistinct punctures. Scutellum black. Elytra elongate oval-oblong, a little wider at base than prothorax, with narrow explanate margin and small humeral prominences, shallowly and rather coarsely punctate; a narrow black margin at base often uniting with spots on humeri, a usually piceous sutural vitta, extending from basal fourth to apical three-fourths,

expanding at middle and apex as if joined with spot, two lateral and three median spots on each elytron, the first median near base of vitta, the second median opposite middle expansion of vitta, and third median at apical expansion, the two lateral not opposite but placed between these median spots. Body beneath yellow, finely pubescent, abdomen and meso- and metasterna slightly darker.

*Length*.—4.5 mm.; width 2 mm.

*Type and paratype*.—Cat. No. 29158, U.S.N.M. One paratype in British Museum.

*Type locality*.—Crescent City, Fla.

This species is based on two specimens, one collected at Crescent City, Fla. (Hubbard and Schwarz), the other merely labeled Fla. Coll. C. V. Riley, probably from the same source. It differs from *scalaris* in having smaller eyes and narrower elytra, and in having an additional spot on margin of elytra. It differs from *nigrosignata* in having coarser punctation and dark basal margin and sutural vitta and smaller number of spots. The humeral prominences are slightly more marked. There is one specimen of the same species in the British Museum without locality label.

### 31. OEDIONYCHIS CIRCUMDATA (Randall)

Figs. 35, 36

*Haltica circumdata* RANDALL, Bost. Journ. Nat. Hist., vol. 2, 1838, p. 48.

*Oedionychis limbata* MELSHEIMER, Proc. Acad. Philadelphia, vol. 3, 1847, p. 162.

*Oedionychis quercata* (not of Fabricius) CROUCH, Proc. Acad. Philadelphia, vol. 25, 1873, p. 63.—HOEN, Trans. Amer. Ent. Soc., vol. 16, 1889, p. 194.

Oblong-oval, feebly shining, yellow brown, the elytra piceous with yellow margin, this slightly wider at apex. Antennae slender, half length of body, basal joints paler, third joint usually not quite so long as fourth. Head with occiput darker, finely and faintly punctate, median groove distinct, interocular space fully half as wide as head. Pronotum over twice as wide as long, with wide explanate margin, arcuately narrowed anteriorly, shining, very faintly and sparsely punctate. Scutellum piceous. Elytra broadly oblong-oval, with sides nearly parallel, with broad, explanate margin; umbone prominences well defined with deep depression within; punctation shallow, moderately coarse, finer toward apex; color usually entirely piceous except for yellow margin, this broader at apex, occasionally with two oblique reddish brown marks or dots at basal third of elytra, near suture. Body beneath finely pubescent, with meso- and metasterna and abdomen dark brown, legs yellowish or reddish brown, anterior legs paler, epipleura pale.

*Length*.—3.5 to 5 mm.; width 1.7 to 2.5 mm.

*Type locality*.—Vicinity of Boston, Mass.

*Distribution.*—Massachusetts, New York, Pennsylvania, New Jersey, Ohio, Illinois, Michigan, Missouri, Maryland, District of Columbia, Virginia, North Carolina, Alabama, and Tennessee.

*Oedionychis circumdata* has been one of the most confused of the North American species of *Oedionychis*. In most collections it has been labeled *Oe. quercata* Fabricius. Examination of the old Bosc collection at Paris shows that the original *Oe. quercata* has rounded elytra, and elytral margins varying from reddish (Fabricius' *ferrugineus*) to piceous (see description of *Oe. quercata*). Randall's brief description of his *Oe. circumdata* appears to be the earliest recognition of this wide-spread species. He described it as having the head somewhat black, the thorax testaceous and elytra black, densely punctured, with a testaceous margin. It was collected in the vicinity of Boston. Nine years later Melsheimer described a species from Pennsylvania, closely allied to *quercata*, as *Oedionychis limbalis*. The Melsheimer type at the Museum of Comparative Zoology has the pronotum rather obscurely yellowish brown, which is undoubtedly the result of discoloration and not a specific character. Crotch in 1873 placed *limbalis* as a synonym of *quercata*. Horn in 1889 added a finishing touch of confusion by describing a variety of *Oe. limbalis*, var. *subvittata*, and also by putting the Fabrician species, *Oe. obsidiana*, as a variety of *Oe. quercata*. Examination of the Horn collection shows that what Horn described as *Oe. limbalis*, together with his variety *subvittata*, is a distinct species and not at all the *limbalis* of Melsheimer (see *Oe. subvittata*).

*Oe. circumdata* differs from Horn's dark form of *limbalis* in shape. Horn lays much stress on the fact that *limbalis* is the most "broadly oval species in our fauna," whereas *Oe. circumdata* tends to have quadrate elytra, especially in the male. In Horn's collection are no specimens with so darkly piceous elytra as the original Melsheimer *limbalis*. Horn's specimens are plainly the darker, usually reddish brown form of his variety *subvittata*. The punctuation in the main is sparser and coarser than in *circumdata*. I have not seen any specimens of *Oe. circumdata* from north of Massachusetts, whereas Horn's *limbalis* (*subvittata*) occurs as far north as Quebec.

The beetle described by Horn as a form of *Oe. quercata* with yellow thorax is really Randall's *Oe. circumdata*. But he has confused under the form having a dark thorax the Fabrician species *Oe. obsidiana* which bears only a superficial resemblance to *Oe. circumdata*. In *circumdata* the prothorax is never piceous and the eyes are small and widely set, the interocular space being fully one-half the width of the head, whereas in *obsidiana* the prothorax is more or less piceous and the eyes are large, the interocular space

approaching one-third the width of the head. In *circumdata* the shape of the elytra is more quadrate, in *obsidiana* the prominences at scutellar angle are more distinct. The punctuation in *circumdata* as a rule is coarser and the surface only moderately shining. The apical pattern of *obsidiana* never occurs in *circumdata*, the latter having only a slightly wider yellow margin at apex. In both *obsidiana* and *circumdata* are forms having two oblique marks or dots, reddish brown or yellowish, on upper half of elytra.

I have found the beetles feeding in early spring on the tender leaves of beech (*Fagus grandifolia*) and walnut (*Juglans cinerea*) as well as feeding on the leaves of *Plantago lanceolata* and *Verbena urticaefolia*.

### 32. OEDIONYCHIS OBSIDIANA (Fabricius)

Figs. 37, 38, 39, 40, 41

*Galleruca obsidiana* FABRICIUS, Syst. Eleuth., vol. 1, 1801, p. 499.

*Alitica obsidiana* OLIVIER, Ent., vol. 6, 1808, p. 691.

*Oedionychis quercata* HORN, Trans. Amer. Ent. Soc., vol. 16, 1889, p. 194 (not Fabricius).

Small, oblong-oval, shining, piceous with pale margins and pale apex to elytra. Antennae half length of body, slender, pale with darker terminal joints, third and fourth joints nearly equal, fourth, occasionally slightly longer. Head more or less piceous, very faintly and finely punctate; median groove distinct, interocular space considerably less than half width of head. Pronotum over twice as wide as long, with wide, pale, explanate margin, arcuately narrowed anteriorly, shining, with few faint, indistinct punctures; entirely piceous except for margin, occasionally a lighter median streak. Scutellum piceous. Elytra oblong-oval with explanate margin; basal callosities at scutellar angle and humeral prominences, especially the former well marked, depression between deep; shining, punctuation fine and shallow, indistinct toward apex; entirely piceous except for pale margin and apex; apical pattern differing from broad, pale apical margin of *circumdata* by having a somewhat scalloped outline. Body beneath finely pubescent, meso- and metasterna and abdomen dark brown or piceous, sometimes femora of hind legs piceous, anterior legs and tibiae and tarsi of hind legs paler, epipleura usually pale.

*Length*.—3 to 4 mm.; width 1.8 to 2 mm.

*Type locality*.—Carolina.

*Distribution*.—Maryland, North Carolina, "Carolina," Georgia, Florida, Alabama, Louisiana, Tennessee, Arkansas.

Specimens from Florida in the National Museum differ from the typical form by having elytra almost entirely black with only the

extreme apex pale. Another series of specimens from Florida are entirely deep chocolate brown in color, with no distinctly paler margins or apex.

*Oedionychis obsidiana* in its typical black form has long been confused with *quercata*.<sup>21</sup> Both species were described by Fabricius, *obsidiana* as shining black with margin of thorax and tip of elytra and legs pale, and *quercata* as with head and thorax ferruginous and elytra black, with a ferruginous margin. Olivier gives two figures<sup>22</sup> showing these differences. The most striking characters of *obsidiana* are its darker head and pronotum and its typically pale apical pattern and paler legs. It differs also in having larger, more closely set eyes. In *quercata* the interocular space is about half the width of the head, whereas in *obsidiana* it is less than half, approaching one-third the width of head. The elytra in *obsidiana* are not so wide and rounded and the rounded callosity at base of each elytron at scutellar angle is very prominent. The punctation is finer and the surface more shining.

A cotype was examined by the writer in the Bosc collection at Paris.

**OEDIONYCHIS OBSIDIANA FLAVA, new variety**

Head more or less piceous even in palest forms, pronotum with dark blotches, usually in form of two oblique marks on either side, variable in size, elytra very variable in pattern, sometimes pale yellow with piceous spots on humeral prominences, sometimes this dark marking extending across base of elytra, spots laterally and medially, frequently uniting to form band across middle of elytra, and usually a band or remnant of band at apical fifth.

*Type and 20 paratypes*.—Cat. No. 29159, U.S.N.M.

*Type locality*.—Mobile, Ala.

*Distribution*.—Alabama, Louisiana, Tennessee, Illinois, Arkansas, and Kansas.

Described from 21 specimens in the National Museum from Alabama, Louisiana, Tennessee, and Arkansas.

This pale form intergrades with typical *obsidiana* through specimens with spots and fasciae of varying width, the elytra sometimes being almost entirely piceous except for yellow streaks or spots at basal third, again with three broad fasciae across elytra resembling in pattern *Oedionychis scalaris*. It was described and figured by Horn as a color variety of *quercata*.<sup>23</sup> A series of specimens from Alabama, also two from Arkansas in the National Collection, show a perfect gradation of pale yellow forms to typical black *obsidiana*.

<sup>21</sup> Horn, Trans. Amer. Ent. Soc., vol. 16, 1889, p. 194.

<sup>22</sup> Ent., vol. 6, p. 691, pl. 2, fig. 32, and pl. 3, fig. 40.

<sup>23</sup> Horn, Trans. Amer. Ent. Soc., vol. 16, 1889, pl. 6, fig. 4.

A most striking characteristic holding throughout the series is the apical pattern. In the pale forms there is a band at the apical fifth with scalloped outline, the apex always pale. In typical *obsidiana* this scalloped apical pattern is nearly always present. The yellow variety appears to be a more southern and perhaps inland form, all specimens examined occurring in Alabama, Louisiana, Tennessee, Illinois, Arkansas, and Kansas. Typical black *obsidiana* occurs in Florida, North Carolina, and Maryland, as well as westward to Alabama and Arkansas.

Specimens of the typical *obsidiana* have been collected near Baltimore, Md., by W. A. Hoffman, feeding on *Ilex verticillata* and *Euonymus americanus*. W. D. Pierce collected the yellow variety on *Ilex opaca* and oak, and R. A. Cushman collected it also on *Vaccinium virgatum*.

### 33. OEDIONYCHIS SCALARIS Melsheimer

Figs. 42, 43, 44, 45

*Oedionychis scalaris* MELSHEIMER, Proc. Acad. Philadelphia, vol. 3, 1847, p. 163.

*Oedionychis lobata* LeCONTE, Col. Kans., 1859, p. 24.

*Oedionychis scalaris* CROUCH, Proc. Acad. Philadelphia, vol. 25, 1873, p. 63.—

HORN, Trans. Amer. Ent. Soc., vol. 16, 1889, p. 194.

Broadly oblong-oval, feebly shining, yellow brown; elytra usually three-banded, varying from lightly blotched or even subvittate with only remnants of reddish brown bands to almost entirely piceous. Antennae slender, about half length of body, third joint sometimes slightly shorter than fourth, basal joints pale yellow, terminal darker. Head faintly and finely punctate, usually a dark spot on occiput, median groove distinct; eyes very large and closely set, interocular space less than half, approaching one-third width of head. Pronotum nearly three times as wide as long, with broad, explanate margin, arcuately narrowed anteriorly, very faintly and finely punctate; usually immaculate, in darker forms indeterminate darker markings on either side. Scutellum small, varying from yellow brown to piceous. Elytra broadly oblong-oval with distinct basal callosities near suture and umbone prominences and well-marked depression between, and with wide, slightly reflexed, explanate margin; punctations dense but shallow, coarser at base; pattern on elytra usually consisting of wide sutural vitta not reaching apex and three transverse bands of irregular outline near base, at middle, and at apical three-fourths, usually broadening at ends, these fasciae and sutural vitta often disappearing in part and leaving in lighter specimens irregular blotches, or in darker specimens widening to cover a large part of elytra; margin and apex nearly always unmarked. Body beneath finely pubescent, meta- and mesosterna and abdomen darker than legs, last ventral segment usually lighter; epipleura pale.

*Length*.—4 to 5.5 mm.; width 2 to 2.5 mm.

*Type locality*.—Pennsylvania.

*Distribution*.—Massachusetts, western New York, Pennsylvania, Indiana, Iowa, Michigan, Missouri, Mississippi, Louisiana, Georgia, Florida, and Texas.

This is a most variably marked species, to be distinguished by its large, closely set eyes, its rather short and broad pronotum, and broadly oblong elytra. It is to be separated from the banded forms of *obsidiana* var. *flava* by its relatively larger size and coarser punctation. Specimens examined from Florida present an unusually varied pattern in elytral markings. They are all of the same proportions and have the distinguishing character—the large, closely set eyes.

W. S. Blatchley collected this species at Florida on some species of Ericaceae.

34. *OEDIONYCHIS DURANGOENSIS* Jacoby

FIG. 46

*Oedionychis durangoensis* JACOBY, Biol. Cent.-Amer., Coleopt., vol. 6, pt. 1, Supplement, 1892, p. 318.

Broadly oval, feebly shining, yellow brown or drab, with five or six small black spots on each elytron. Antennae slender, half as long as body, third joint slightly shorter than fourth, first four and part of fifth basal joints and terminal joint paler. Head faintly punctate, more coarsely about eyes, with occiput nearly smooth; median groove indistinct, interocular space not half so wide as head; eyes large. Pronotum nearly three times as wide as long, with moderately wide explanate margin, arcuately narrowed anteriorly, very faintly punctate. Scutellum small, shining black. Elytra long and broadly oval, with wide, sometimes slightly reflexed explanate margin, and with basal callosities near suture and humeral prominences forming sulcus; finely and densely punctate; six small black spots on each elytron placed in two longitudinal rows: First row with spot on humerus, second near lateral margin at basal fourth, third near lateral margin slightly below the middle; second row with first spot in middle of elytron at base, second near suture at basal third, and third near suture, slightly below middle, in some specimens spots in middle at base missing. Body beneath yellowish brown, finely pubescent, epipleura pale.

*Length*.—5 to 6.2 mm.; width 3 to 3.5 mm.

*Type locality*.—Ventanas, Durango, Mexico.

*Distribution*.—Arizona.

This species is not closely related to any other North American *Oedionychis*. It is one of the largest of its group, *Oedionychis scalaris* alone approaching it in size. It is, however, quite distinct

in its shape and markings from *scalaris*. The most outstanding character is the very wide explanate margin. The type has been examined by me at the British Museum.

## DOUBTFUL SPECIES

## OEDIONYCHIS JOCOSA Harold

*Oedionychis jocosa* HAROLD, Col., Heft 15, 1876, p. 124.

Flava, capite, corpore subtus cum pedibus antennisque, thoracis macula transversa elytrorumque sutura et vitta laterali ferrugineis, thorace longitudine paullo plus quam duplo latiore. Long. 5 mm. North America.

## OEDIONYCHIS LONGULA Harold

*Oedionychis longula* HAROLD, Deutsche Ent. Zeitschr., vol. 21, 1877, p. 434.

Oblonga, ferruginea, thorace flavo, obsolete punctato, ferrugineo-fasciato, elytris humeris intus non sulcatis asperulato sat dense punctulatis, sutura vittaque discoidali fusco-ferrugineis; epipleuris flavis, intus ferrugineis; antennis fuscis, articulis 1 — 3 rufescentibus, 3 quarto dimidio brevioribus. Long.  $6\frac{1}{2}$  mm. California.

## OEDIONYCHIS HORNI Harold

*Oedionychis horni* HAROLD, Col., Heft 15, 1876, p. 124.

Ovalis, nitidula, capite ferrugineo, thorace elytrisque testaceis, illo fascia piceo-rufa, his dense et fortiter punctatis, sutura sat late vittaque lata margini approximata piceis, subtus picea, pedibus piceo-rufis. Long. 6 mm. Texas.



## EXPLANATION OF THE PLATES

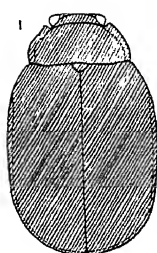
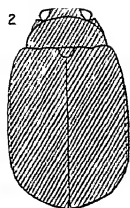
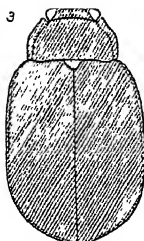
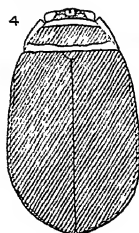
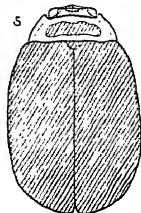
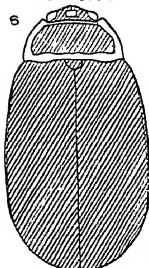
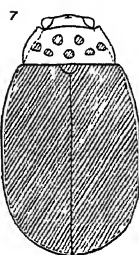
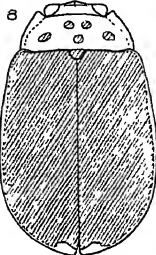
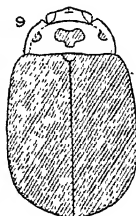
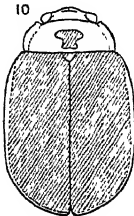
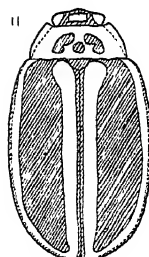
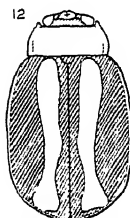
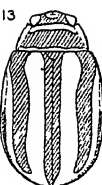
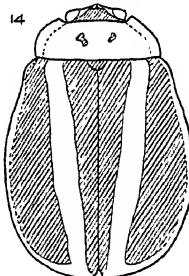
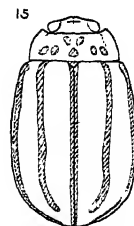
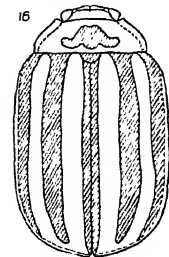
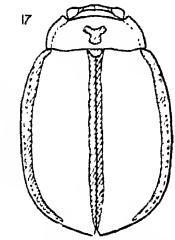
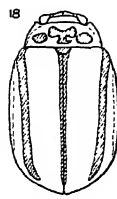
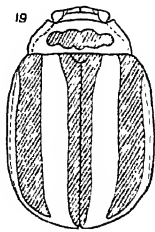
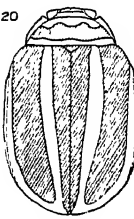
(All figures  $\times 5$ )

## PLATE 1

- FIG. 1. *Oedionychis violascens* LeConte.  
 2. *lugens* LeConte.  
 3. *concinna* (Fabricius).  
 4. *vians* (Illiger).  
 5. *vians* var. *badia* Blake.  
 6. *discicollis* (Crotch).  
 7. *thoracica* (Fabricius).  
 8. *lateralis* Jacoby.  
 9. *gibbitarsa* (Say).  
 10. *flavocyanea* Crotch.  
 11. *fimbriata* (Forster).  
 12. *interjectionis* Crotch.  
 13. *aemula* Horn.  
 14. *amphivittata* Blake.  
 15. *tenuilineata* Horn.  
 16. *petaurista* (Fabricius).  
 17. *petaurista* var. *pallida* Blake.  
 18. *miniata* (Fabricius).  
 19. *miniata* (Fabricius).  
 20. *ulkei* Horn.

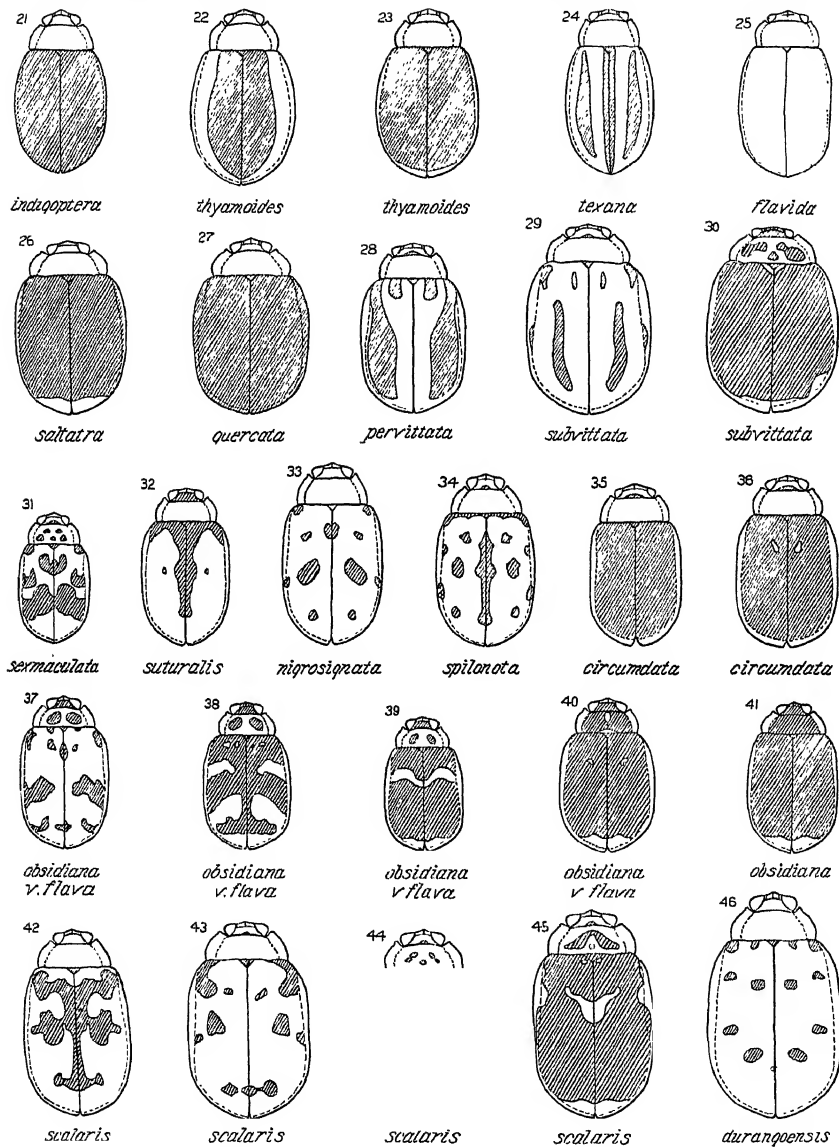
## PLATE 2

- FIG. 21. *Oedionychis indigoptera* LeConte.  
 22. *thyamoides* Crotch.  
 23. *thyamoides* Crotch.  
 24. *texana* Crotch.  
 25. *flavida* Horn.  
 26. *saltatra* Blatchley.  
 27. *quercata* (Fabricius).  
 28. *pervittata* Blake.  
 29. *subvittata* (Horn).  
 30. *subvittata* (Horn).  
 31. *seamaculata* (Illiger).  
 32. *suturalis* (Fabricius).  
 33. *nigrosignata* Schaeffer.  
 34. *spilonota* Blake.  
 35. *circumdata* Randall.  
 36. *circumdata* Randall.  
 37. *obsidiana* var. *flava* Blake.  
 38. *obsidiana* var. *flava* Blake.  
 39. *obsidiana* var. *flava* Blake.  
 40. *obsidiana* var. *flava* Blake.  
 41. *obsidiana* (Fabricius).  
 42. *scalaris* Melsheimer.  
 43. *scalaris* Melsheimer.  
 44. *scalaris* Melsheimer.  
 45. *scalaris* Melsheimer.  
 46. *durangoensis* Jacoby.

*violascens**lugens**concinna**vians**vians v. badia**discoidalis**thoracica**lateralis**gibbistarsa**flavocyanea**fimbriata**interjectianis**aemula**ampli vittata**terulilineata**petaurista**petaurista v. pallida**miniata**miniata**wkei*

## NORTH AMERICAN BEETLES OF THE GENUS OEDIONYCHIS

FOR EXPLANATION OF PLATE SEE PAGE 44



## NORTH AMERICAN BEETLES OF THE GENUS OEDIONYCHIS

FOR EXPLANATION OF PLATE SEE PAGE 44





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